

AVIATION WEEK

A McGRAW-HILL PUBLICATION

DEC. 19, 1955

50 CENTS

VERSATILITY...



Commercial Airliner



Flying Hospital Ship



Executive's Flying Office



Electronic Test Plane



Military Transport



Turboprop Transport



Navigator-Bombardier Flying Classroom

thru engineering to the Nth power

Unmatched in its flight range for speed, efficiency, and economy of operation... unexcelled for reliability — the Convair is now flown by thirty-five leading airlines throughout the world! It performs scores of tasks for the U. S. Air Force and the U. S. Navy! It serves science as a flying electronic laboratory. And it's the choice of leading corporations as an executive transport. The Convair continues to set new records for versatility and performance — evidence again of Convair's *engineering to the Nth power!*

CONVAIR

A DIVISION OF GENERAL DYNAMICS CORPORATION



**New Holley turboprop
power control
Installed in Lockheed R7V-2**

Gas turbine and air passengers at speeds up to 140 miles per hour in the Navy's new Lockheed R7V-2 turboprop Super Constellation. Four Pratt & Whitney Aircraft axial flow T-33 propeller aircraft engines develop a total of 32,000 horsepower for take-off. Each of the four is automatically controlled by a new Holley gas turbine power control.

Greater accuracy in fuel metering to maximize their high performance ratings and at the same time control operation within strict safety limits. Through a system of automatic measuring four separate series, the Holley control automatically meters corrected fuel flows to the engine in accordance with the engine operating requirements.

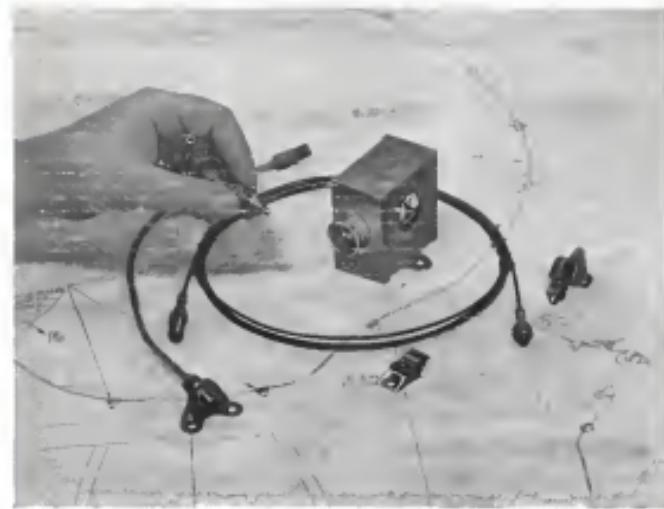
Leader Is The Design, Development, and Manufacture of Aviation Fuel Metering Systems.



Leader Is The Design, Development, and Manufacture of Aviation Fuel Metering Systems.

Light weight, compact means of accurately metering fuel consistent with engine requirements.

This and other Holley developed fuel metering devices have played an important role in our country's undisputed leadership in the design, development and manufacture of superior strength,



**Tested, proven, and in production...
the only double-duty aircraft fire detector!**

Consisting essentially of a heat-sensing element and a transistor-triggered control unit, the Kidde Aircraft Fire Detector is the first to give both an immediate nozzle actuation danger signal and a fire alarm when temperature reaches a critical degree. Its hermetically-sealed control unit needs no shock or vibration insulation, has no vacuum tubes, and the entire unit requires no resetting after a fire. Here's how it works:

Located in the engine nozzle, the fire-sensing element—a long, wire-like unit—transmits nozzle temperature changes to the control unit, which is pre-set as to remain on standby throughout the normal nozzle temperature range.

When the nozzle temperature rises above maximum normal, the control unit recognizes "potential trouble," and triggers an ABNORMAL TEMPERATURE signal.

However, if there is a sudden dash of fire in the nozzle, the control unit interprets the rapid rise

in temperature as a definite danger condition, and a FIRE ALARM is actuated. The pilot then operates the nozzle fire extinguishing system to put the blaze.

During any gradual temperature rise above maximum normal, the ABNORMAL TEMPERATURE signal remains operative all through the rise, and is replaced by the FIRE ALARM when a predetermined fixed fire temperature has been reached.

Lightweight and compact, the Kidde Aircraft Fire Detector can be adapted to meet the needs of all aircraft produced today. For more information, write Kidde now.

Kidde 
 The word "Kidde" is in bold, sans-serif capital letters. To the right of the logo, the text reads: "The world's largest producer of fire and smoke detection and control instruments for aircraft and space vehicles." Below this, it says: "Walter Kidde Company, Inc., 1211 Main St., Belleville, N.J., Walter Kidde & Company of Canada, Ltd., Montreal-Toronto."

Phillips 66
PRESENTS

MILESTONES IN AVIATION



Squadron of Aces

In World War I, the famous "Hat in the Ring" 94th Pursuit Squadron, U.S. Air Service, claimed up to 100 victories. American pursuit aviation has since won from the 1930s to 1950s, more than 1,000. In March of 1918 from April 14, 1918, through November 11, 1918, pilots of the 94th Pursuit Squadron scored 665 victories over enemy aircraft. This figure does not include Major René Lufbery's 17 victories, which were all scored while he was attached to the French Army. Personnel of the 94th included two "Aces," and commanding officer Captain "Pete" Rickenbacker, with a total of 26 victories plus one in his credit, became America's "Ace of Aces."



It's Performance that Counts!

Phillips Petroleum Company has performed outstandingly in one of the country's largest importers of aviation fuels for military and commercial use. Phillips now produces enormous quantities of 115/145 grade aviation gasoline, and also handles the most modern fuels for the latest designs in turbo-props and jets.

During World War II, Phillips was first to manufacture Di-isopropyl and HF Alkylic, two power-pumped aviation fuel components of almost importance in modern high-speed performance.

In aircraft fuels it's performance that counts. And Phillips 66 products are outstanding for performance!

**"ACES" of the
"HAT IN THE RING" 94th PURSUIT SQUADRON**

Ensign Edward V. Rickenbacker	34 victories
Ensign Frank Luke	20 victories
Ensign Eddie Rickenbacker	18 victories
Ensign Doug Campbell	16 victories
1st Lieutenant René W. Fonck	15 victories
Ensign Hamilton Gough (killed in action)	8 victories
Major René Lufbery* (killed in action)	7 victories

*Major Lufbery, first commanding officer of the 94th, was the first pilot ever to score 100 victories. He died in 1925 at the age of 30. He had been flying for only 12 months and had served 100 hours of combat flying. His war record amounted to May 14, 1918, while in command of the 94th.



AVIATION PRODUCTS

AVIATION DIVISION
PHILLIPS PETROLEUM COMPANY
BARTLESVILLE, OKLAHOMA

DECEMBER 15, 1953

AVIATION WEEK

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ADVERTISING C

FACTS

about

NEW DEPARTURE STEEL BALLS



**Available in any quantity
to fit your specifications
tor grade, size and accuracy!**

When industry wants steel balls of proven accuracy and dependability, it is only natural that they turn to New Departure. Quality production is the cornerstone and cornerstone quality is the guarantee of the manufacture of precision balls. Today, New Departure provides industry with high-carbon chrome and stainless steel balls in a wide range of sizes and specifications.

New Departure balls are produced from the finest high-carbon chrome steel, AISI Type E511100 steel, specially made for New Departure. It is heat-treated to achieve the proper hardness and toughness for maximum strength and durability. The final heat treatment is a special AISI Type 460C, used by New Departure results in balls of much improved hardness and load-carrying ability.

In addition to producing the finest steel balls available, New Departure will fill volume orders for balls of special materials such as high-carbon or carbon-free alloys, tool steel and others.

NEW DEPARTURE • DIVISION OF GENERAL MOTORS • BIRMINGHAM, CALIFORNIA

New Departure steel balls are produced in a wide range of sizes. The middle column, about 2,000 balls per cubic inch, is diameter. There is enough room in the large ball to make 100,000 of the tiny balls.



Passes control of optics free is achieved with these ball bearing bearings.



Balls are hardened, quenched in oil or water, then tempered in electric furnaces.



These grinders sort balls into bins according to required diameter, then

*Applications range from power steering to pencils



The unique advantages of New Departure steel balls are well known. They have been used in thousands of applications from heavy-duty bearings to the most delicate pencil parts. To accommodate these applications, New Departure steel balls are offered in sizes ranging from .002 inch to 100 inches in diameter.



NEWS DIGEST



New Tail Armament For B-52

Wichita's first B-52 shows a new tail armament, probably the fourth different system to be incorporated in the Boeing heavybomber series. The pt launcher's battery appears to be four canons mounted around a tracking radar antenna. Above the tail at a larger scale and above that, an optical sight for the tail gunner.

Stuart Tipton Elected President of ATA

Stuart G. Tipton was elected president of the Air Transport Association last week at a biannual dinner meeting in Washington. Tipton, who has been general counsel of ATA for the last 11 years, succeeds Harold Pruzin who decided not to stand for re-election after his policies were rejected by ATA members.

Charles J. Lewin, Jr., was sworn in as Compt Assessor of Administrators last week succeeding Fred B. Lee (AW Dec. 12, p. 112).

Lewin's appointment immediately was endorsed by Secy. Mike Mooney (D-Okla.), chairman of the Senate Commerce Committee's Aviation Subcommittee, who challenged Lee's nomination under Administration pressure. He has threatened to conduct an investigation of the Lee nomination as "an attempt by the Commerce Deptt. men's grand-standing clique to scare control of all civil aviation."

One long-range navigation system for supersonic bombers will be produced by International Business Machines Corp under an \$11.6 million Air Force contract. The system, developed by the company's Armonk Computer Laboratories, principally employs the new digital techniques.

Chance Vought's F8U-2 Crusader has flown 1,059 miles in trials at Edwards AFB, Calif. The Navy fighter is

powered by a Pratt & Whitney J57 engine. Defense Secretary Charles E. Wilson recently signed permission for the Navy to make an official attempt to break the world speed record in the F8U (AW Dec. 12, p. 7).

United Airlines announced a settlement with its striking AFL-CIO flight engineers, ending a seven-week walk out. The engineers, whose strike forced to cancel United's service, walked out to protest a company ruling that all non-pilot engineers be qualified pilots. One provision of the agreement provides that non-pilot flight engineers already employed by United will be given flight training to bring them up to the level of the new employees.

An Air Force has awarded Ford Motor Co \$505,753,800 contract for 150 pt engangs. The engine was designed by Pratt & Whitney.

Non-homing-navigation systems for supersonic bombers will be produced by International Business Machines Corp under an \$11.6 million Air Force contract. The system, developed by the company's Armonk Computer Laboratories, principally employs the new digital techniques.

McDonnell Aircraft earned 25,593 pt engangs last year in the last No. 1 engine built in its history.

Foreign

Despite official demands, Australia's Queen Elizabeth II will place an order for British jet transports early next year. This government-owned airline probably will order to either Boeing or Douglas, although British political and economic pressure is being brought to bear for the purchase of de Havilland's Comet 4.

Bristol Siddeley turboshaft engines will power the Fiat G-91 light fighter being produced by the North Atlantic Treaty Organisation. Under the contract signed by Fiat and Bristol Aero Engines Ltd, Fiat also gets exclusive rights to the manufacture and sales of all Bristol turboshaft engines in Italy.

AVIATION CALENDAR

Jan. 9-10—Second National Symposium on Reliability and Quality Control. Sponsored by the Society in Memory of Radio Engineers Hotel Statler, Washington.

Jan. 10-11—AIAA-DARWAN Flight & Symposium, sponsored by Institute of Safety of America-Santa Fe, Sherry Ball Inn Hotel, Santa Fe, New Mexico.

Jan. 14-15—Meetings of Aviation Engineers Association, Sherman-Cadillac and Studebaker Hotels, Detroit.

Jan. 15-16—California Air Transport Planning Conference, sponsored by the State of Transportation and Traffic Engineering, University Petroleum, later named the University of California, Berkeley, Calif.

Jan. 19-21—National Standards Conference sponsored by Defense Dept. Work Groups of Committee of Radio Engineers, Group of Electronic Computer, Dallas, Tex.

Jan. 21-23—Meetings of the Aerospace Society, 19th annual meeting, Americana Motor Hotel, New York, N.Y. Jan. 23—Heavy Night Dances.

Jan. 25-26—First Maintenance & Engineering Show and Conference, Convention Hall, Philadelphia.

Feb. 21—National Symposium on Microelectronics sponsored by New York Institute of Radio Engineers, American & Foreign Groups, Group and Theory & Techniques Group, Philadelphia.

Feb. 22—Society of the Plastics Industry, 13th annual Reinforced Plastics Division meeting, Chalfonte-Haddon Hall, Atlantic City, N.J.

Mar. 19-21—Meeting of Automotive Engineers, national automotive meeting, automotive producers bureau and aircraft engineering division, Hotel Statler, Cleveland, Ohio.

Mar. 19-22—Design for Management and Applications meeting, Congress Center, sponsored by Material Research Institute, University of Kansas City, Kansas City, Mo.

Apr. 22—Beverly Hills Aviation, Annual Meeting, Beverly Hills Convention Hotel, Beverly Hills, Calif.

May 2—Meeting of Aeromedical Weight Institute, 14th annual meeting, Fort Worth, Texas.

May 24-25—Flight Design Engineering Show, Convention Hall, Philadelphia, Managed by Clapp & Polk, Inc., 141 Madison Ave., New York, N.Y.

June 1—Meeting of Automotive Engineers, summer meeting, Chalfonte-Haddon Hall, Atlantic City, N.J.

June 14-15—Society of the Plastics Industry, Seventh Annual Plastics Exposition, New Coliseum, New York, N.Y.

June 21-22—American Society of Mechanical Engineers annual meeting, Hotel Statler, Boston, Mass.

June 17-21—American Society for Testing Materials 55th annual meeting and 12th inspection project, Chalfonte-Haddon Hall, Atlantic City, N.J.



**NEW!
WNH
CLAMP**

Presenting the latest member of the famous Monogram family of sheet metal stamps...the WNH or Wing Nut Hexagon Clamp. For use where extremely strong tension is required.

Installation of the WNH is far easier because of the free-spinning action of the bi-type wing nut. Stronger hexagonal body permits use of holding tools. It sizes for drill holes from .096" to .197" and material thickness from .07" to 3". Send coupon for catalog and name of your nearest Monogram representative.

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MONOGRAM
MANUFACTURING COMPANY

A DIVISION OF INTERNATIONAL B-A-B CORP.

WHO'S WHERE

In the Front Office

5 E. Franklin, vice president-engineering and manager of the software computer division, Brooks Aircraft Corp., Director Mark Williams A. Ulrich, staff assistant, vice president and manager, Power Control Division, Foxair Aviation.

Mark Shepard, Jr., promoted from senior systems engineer to vice president-director Product Division, Turner Industries, Inc., Dallas.

Robert S. Anderson, former Design Services director of Defense, has joined Divison Six in division Inc., Dallas, Tex., as manager of the executive committee.

Michael P. Feltz, Jr., formerly with the president, Radio Corp. of America, Inc., has recently been assigned a P-110 simulator development at Elgin Manufacturing Co.

Harvey S. Vinton, vice president, Timken-Dresser, Inc., Chicago, Ill., is leaving Timken.

Honors and Elections

Frederick Dorn, assistant to Civil Aviation Board member Charles Gorrie, has been named director of the Air Traffic Control Bureau's Experiment Office effective July 1.

William J. Morris, Jr., has been elected treasurer, elected president of the Alaska Airlines and Anchorage Conference of Air Transport Association of America.

T. B. Walkowicz, announced engineer-in-chief of Louisville Rockcastle & B. A. Associates, has been elected to president of Ohio Metal Casting Association, and was also elected to the enlarged board of Midwest Aircraft Co., Van Nuys, Calif.

Changes

George H. Steiner has been given overall responsibility for program planning for the Space Shuttle Program, and will be placed on Seattle, Wash. His research director, the director's producer and test director, C. M. (Shack) Moore, facilities manager and project architect.

R. T. Rennick, German aircraft designer and formerly with Wright Jet Co., independent designer, has joined Aeroplane Development Corp., San Jose, Monterey, Calif. as chief engineer.

At Mission, California, Lockheed Missiles and Space Co. has appointed James G. Spangler to the Special Projects Division.

Thomas E. Spokane, general manager, Aviation Division, Phelps Manufacturing Co., Chicago, Ill.

Glacier, N.J.—Stanley Corso-Wright, Corp., Westchester, N.Y. J. M. E. Jenkins, former service manager, leaves Corso-Wright as secretary.

Warren C. Davis, service manager, General Aviation Sales Department, Union Switch and Signal Division, Washington, D.C., has been promoted.

Robert M. Patterson, aerospace engineer, formerly vice president-engineering, Avco Inc., N.Y.

(Continued on page 56)

INDUSTRY OBSERVER

► Watch for Military Air Transport Service to have a substantial number of Boeing C-47s jet transports. MATS has completed evaluating the Boeing and Douglas jet transport designs. Major factors favoring the Boeing transport are poor USAF maintenance on the KC-135 tanker and earlier delivery dates. MATS is anxious to get into the jet transport picture as soon as possible.

► General Electric's J79 turbojet, which is in the 32,000 lb thrust class, completed its 150-hr type test. The engine has a thrust-weight ratio approaching six, a 40-in. diameter and is designed to use a maximum of solid propellants. GE is planning jet production of the J79 and moving toward volume production of the J73. The company produced approximately 35,000 J73 turbines. The J79 production program will be terminated early in 1970.

► Convair is expediting an extensive test program for its B-II subsystems prior to first flight of the supersonic bomber at Ft. Worth, Tex., next fall. Present plans call for a total of two B-Ms, three C-131Bs as PBIs, F-100 and a B-47. Initial subsystem flight tests have already been started in a B-58.

► Rockwood sheet for aircraft skin, developed by Olin-Matheson, is being studied by Lockheed and McDonnell as a possible solution to thermal-dissolve problems at high speeds. Sheet is fabricated with integral channels through which heat or coolant could be circulated (AW Nov. 29, 1959, p. 37). Transport manufacturers are studying the possibility of using the material in a fuel-carrying skin.

► NASA is concerned that production bags have been worked out of Tucson sheet as navigation systems and has ordered Federal Telecommunications Laboratory to begin production of the improved models.

► U.S. Army is considering a proposal by Convair, Culver City, Calif., to convert its L-17 liaison planes to a twin-engine configuration. Convair, a major producer of Twin Navions, recently received approval from the Civil Aeronautics Administration to increase the gross weight of its Model 480 from 3,900 lb. to 4,323 lb., providing a 1,323 lb. useful load.

► Lockheed Aircraft is constructing a new facility at its Marietta, Ga., plant to check induction patterns of aircraft structures and equipment subjected to atomic explosive. Transportation and handling of the materials under test will be done by remote control.

► Casting Glass Works is developing a new sodium and calcium glass highly resistant to thermal and mechanical shock for flight speeds of Mach 2 and faster.

► Lockheed is considering the Bristol BE225 turboprop engine for eventual installation on its 1849 Super Constellation. Decision hangs on whether Carter-Wright builds the engine.

► American Airlines faces a problem of where to locate its smooth-surface fleet. About 70 aircraft, including 100 jets, up to 100 miles overhead base, are unable to leave the airports all day for training flights scheduled around them. To alleviate the jets would be repositioned. American probably will establish its 207 maintenance base at New York International Airport because of its proximity to Hartford, home of Pratt & Whitney Aircraft, maker of the plane's engines. Lockheed has also ample room for future expansion.

► First turboprop propeller to receive certification for a 1,000 hr. overhaul period by the USAF is Aeroproducts Model AD341 FN 19%. One of these propellers was recently mounted on a 1,500 hr. rigester on a USAF Convair YU-1HIC after 1,001 hours of operation. The same propeller, which also has a CAA type certificate, probably will be installed on Lockheed's Electra turboprop transport.



Left to right, from top to bottom: McDonnell F-4D; North American F-100; Convair F-106A; Boeing B-52; North American RA-5; F-4D; McDonnell F-4B; Douglas A-3D; Grumman S-2; Sikorsky CH-54 (insets DC-3; Grumman S-2 and S-3).

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Washington Roundup

Hanaman Out

J. Keff Hanaman has resigned as Deputy Assistant Secretary for Public Affairs, as predicted by AVIATION WEEK (Dec. 3, p. 11). He will return to Bell Laboratories, but the aircraft industry probably will find itself with serious morale problems that get worse instead of better. Muscle at top affairs of scratch organizations appear to have been taken up by Leo M. Heges, Deputy Director of the Office of Strategic Services. His morale record was an order first, in effect, taken away all propagation of military aircraft representation in the security review office forces them to go to Defense Department for our division of the type sought by aircraft industry representatives. Heges usually makes things unhappy, particularly with regard to the proposed reorganization. Before Hanaman left, the Security Review Board issued a revised order, putting a ban on release of performance data before a new plane design has been in service for a year. Actually, most performance data now is disclosed and the existing handbook on "Reliable Information Is U.S. Air Force Aircraft" was drafted with that policy in mind.

CAB Scramble

Scramble for the Civil Aeronautics Board chairmanship is in full swing with the prospect that Ross Raday will vacate that post as soon as he is nominated for a Federal judgeship in Oklahoma early in January (AW Dec. 12, p. 1).

The Administration plans are to associate Raday's resignation from CAB, his appointment to a judgeship, and his CAB successor simultaneously.

Three leading candidates for the post are:

- Franklin Stone, 45, general counsel of the Civil Aeronautics Board. Stone who came to the post from a private law practice in Wichita, Mo., served as Wichita County Chairman of the Republican Committee. He is a former FBI agent, served with the Office of Strategic Services during World War II.

- Warren Baker, 41, general counsel of the Federal Communications Commission. Baker is a former CAB hearing examiner who served as executive assistant to former CAB chairman Oswald Ryan, a Republican. He is from Denver.

- Earl Kintner, 43, general counsel of the Federal Trade Commission. Kintner, also an Indiana Republican, joined FTC in 1946 as a trial attorney. He served in the Navy during World War II.

These three candidates meet the broad qualifications for the post laid down by the Republican National Committee. The committee wants a young man precisely fit to represent it so that he will be on duty in his home district appointment because of security clearance.

Defense Operations

Department of Defense is moving some strength into the operating business of the Army, Navy and Air Force. Major changes are being made in the Defense Supply System. Paul Noyes, (Aviation Engineering) and Thomas F. Pike (Supply and Logistics) and Deputy Secretary Brother B. Robertson. The nation's logistician because it splits economy, half inflation of legitimate resources and a cut in inter-service rivalry. However, there are men in uniform and in industry who feel that

a change of requirements and rules pays too little at present to individual service requirements. Full-blown discussions were that the broad cost level of logistics of the three armed services, establishment of a single air force and military establishment. This also has received first-hand report from Vernon Montgomery but he did not gain the concept as he never tour of the U.S.

Pay Limit Reason

Machinations who accepted large overpayments on incentive-type contracts and invited the money in Government bonds while waiting for the Navy to underwrite the price were responsible for the 105% kickback check-off procedure in the Defense Department as a back door to the National Association of Machinists. Rear Adm. Robert E. Scott, Vice Chief of Naval Material and ex-commander admiral's objectives but under the old system the Navy had too much in idle funds, actually working for various contractors. He proposed action to spend relatively under revised Defense Department 4105.2 (AW Dec. 12, p. 13).

Sandia Mountain Crash

Last week hasn't been written yet on the Civil Aeronautics Board accident report covering the Trans World Airlines crash at Sandia Mountain near Albuquerque on Feb. 19 (AW Nov. 25, p. 82). This will probably be the second CAB accident report received by industry because pointing out facts contained in the first report. First was the Northwest Air Lines Lockheed involved during Korean war contract operation in which a second report was strongly worded by CAB (AW Nov. 25, p. 115; Dec. 12, p. 11).

Seaboard Bid

Latest entrant in the bidding for operating control of the proposed Atlanta National Airport is Seaboard & Western Air Lines, recently rechristened for an all cargo transatlantic route. Seaboard has the route track to Atlanta deal for a New York-Vietnam run. The mileage has picked up the negotiations at the point they were dropped by the domestic non-scheduled carrier group, North American Airlines.

Seaboard sent a number of sub-agents to an operating contract with the Avianets as its adjunct to its own scheduled commercial cargo service which will start soon. Equipment is no problem for SW, which is what forced North American to abandon its plan. Seaboard is operating a mixed fleet of DC-8s and Super Constellations, of which two of the latter are on lease to British Overseas Airways Corp. and April 1958. An additional order for 10484 Cessna 440 was placed by Seaboard with an option to buy the financing from a new company which includes NAA officials.

Pearson Job Hunting

World "Pete" Pearson, recently fired as president of the Am Transport Assn. (AW Dec. 2, p. 31), is already seeking appointment as an Assistant Secretary of the Army. His chances are dim. Pearson previously served with the Department of the Army as an assistant to Earl Johnson, Pearson's predecessor as ATA president. —Washington staff

U.S. Plans to Launch 12 Earth Satellites

1957-58 launches probably will be staged in Florida. Satellite observation a major problem.

By Philip J. Klass

New York.—The U.S. plans to launch 12 earth satellites during the 1957-58 International Geophysical Year providing Congress approves the necessary supporting funds.

The satellites probably will be launched from the Air Force Missile Test Center, Patrick AFB, Fla., although the Australian Weapons research range is another possible site.

Exact figures on the number of satellite-launching launches planned, plus other launching unchanged details on the U.S. satellite program, were revealed here by Dr. James V. Van Allen, Director of the Space Sciences Division of the U.S. Army Research and Development Command, and Dr. Martin M. Schwartz, Chairman of the joint committee of the American Rocket Society and the Institute of Radio Engineers.

Van Allen, head of the State University of Iowa's Physics Department, is a member of the Upper Atmospheric Research Panel Subcommittee, former head of rocket propulsion at the California Institute of Technology's Jet Propulsion Laboratory, is now professor of jet propulsion at Princeton University.

Dr. Van Allen revealed that:

- Keeping the satellite under observation and recovering it after telecasted data is expected to be "more difficult than getting the satellite up there in orbit."
- Balloon-launched satellites, using existing two-stage rockets as an alternative

in an armed three-stage rocket launched from the earth, are another solution. An American authority, as well as by USSR U.S. interests [AW Oct. 10, p. 45].

• U.S. scientists, who made up the original satellite proposal for the Geo physical Year, yet no advance indication of stepped approach to the official White House announcement [AW Aug. 8, p. 140].

• Satellite orbit probably will be a designed flight path, a conicoparabola polar and an equatorial orbit.

The location of the launching stage itself will be a determining factor on the choice of orbital path, Dr. Van Allen said. The USSR's orbital range is centered about 45 degrees from north and points in an easterly direction, so advantage since the satellite would gain a portion of the earth's rotational velocity.

Satellite Life

The useful life of the satellites before they slow down and orbit ends on the earth's atmosphere where they will disintegrate will depend upon the initial orbital altitude achieved. In orbiting the earth's satellite life at different altitudes, Schwartz said, Dr. Van Allen came up with slightly different figures.

Schwartz predicted a satellite life of about one year at the initial orbital altitude reached in 100 miles.

The life span would drop to 15 days at 200 miles altitude and less than one hour at 100 miles, Schwartz said.

Satellite Award

Contact for the second stage of the three-stage rocket vehicle to be used in the Project Vanguard earth satellite program was awarded by the Navy Department to Avco Corp. [AW, Oct. 10, p. 45].

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• Satellite orbit probably will be a designed flight path, a conicoparabola polar and an equatorial orbit.

The final velocity of a three-stage rocket required to put the satellite into an orbit 400 miles above the earth was estimated by Schwartz to be between 23,000 and 23,300 ft./sec., depending upon the technique to be employed.

The velocity with the classical "circular orbit" of 36,789 ft./sec., at the 24,000 ft/sec. needed for an intercontinental ballistic missile would be 27,000 ft/sec.

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Bolt-on Ascent

The higher velocity (29,300 ft./sec.) is needed to direct ballistic ascent path to orbiting altitude is used. The lower velocity would be sufficient, Schwartz said, if the rocket employs a tangential approach path in its orbital altitude.

It will not reach this altitude, however, until the satellite is half way around the earth, 12,500 miles away.

Because a lot more heat of energy is needed to keep the satellite from falling back to the earth after its orbiting path, the cost of the entire operation would be extremely difficult.

If the rocket is to go around the earth twice in launching site, Schwartz suggested as an alternative a modified satellite ascent in which the vehicle would coast for a while between burns.

Satellite Characteristics

Components of Viking II and Estimated Satellite Rocket Characteristics

	Viking II	Earth's Satellite	
	1st Stage	2nd Stage	3rd Stage
Specific Impulse	155 sec.	240 sec.	250 sec.
Gross Mass	10,000 lb.	15,000 lb.	2,000 lb.
Thrust	21,000 lb.	35,000 lb.	5,400 lb.
Burning Time	140 sec.	70 sec.	50 sec.
Altitude Miles	2,200 ft.	1,200 ft.	300 ft.
Rate of Descent to Gross Mass	14 ft/sec.	12 ft/sec.	1 ft/sec.
Period	51.5 hr.	26,000 ft.	100 ft.
Δ-Energy	0.0007/sec.	3,000 sec.	11,200 sec.
Total Velocity at Burnout	7,000 ft/sec.	25,000 ft/sec.	28,300 ft/sec.

[Note: First and second stages use liquid fuel, third stage uses solid propellant.]

* Increment of velocity developed by each stage at burnout.

not of the second stage and the firing of the third stage.

He presented the results of his own calculations as to the performance which might be achieved by each stage of the satellite rocket based on the iteration of the Viking II and expected advances in the state of the art [see this issue page 121].

Satellite Exploration

Dr. Van Allen emphasized that the U.S. satellite program "definitely is not a competition to develop radar satellites." The project, he said, will be under civilian control and many countries in the world "will be in it on the merits." Some of the findings, however, undoubtedly will be useful to intercontinental ballistic missile designers, which explains why the Defense Department is supporting the venture with Congress' recognition and authorizing a appropriation.

Van Allen called the satellite program a logical extension of present geophysical studies, "which presumably has been carried out with great observational resolution in the U.S. So such exploration, however, is so short that perhaps only 'as measured and widespread' can be used in the upper atmosphere," Van Allen said.

The satellite will enable scientists to make much more comprehensive measurements and determinations of such things as:

- Cosmic ray energy level, which is greatly attenuated in the rays that pass through the earth's atmosphere. The satellite will enable scientists to measure the variation in cosmic-ray intensity at different latitudes.
- Correlation between solar ultraviolet radiation and the changes which take place in the atmosphere "E" and "F" layers, which as far as often occurs, alter ionosphere radio propagation.

- Whether nonradioactive isotopes of lithium, bismuth and barium, which have been detected in person rocket sounding, exist in the cosmic radiation as it arrives from space or whether they result from a reaction with the earth's atmosphere.
- An density of the upper atmosphere. Van Allen's references is available on the density of air at different heights.

The required number of ground stations could be greatly reduced by launching a radio carried with the satellite to cover over 90 minutes, providing some lightweight sensors can be found to make reliable measurements between solar transits.

Solar infrared, made of silicon and which can generate 3.5 watts per pound weight, appear to be the most promising source of electrical power according to Van Allen. Solar storage batteries will be carried, however, to provide power when the satellite is not exposed in the sun.

Van Allen said the proposed transponder might be designed to transmit data when commanded by an offical ground station. The U.S. has no plans to publish the satellite's total orbiting frequencies and schedule.

136 miles. The rate at which the earth rotates decreases will make it possible to calculate its density at its orbit.

■ Severity and frequency of meteoroid impacts encountered in the upper atmosphere.

Schwartz also set mention to lower mass about a new type of radiation, a sort of "soft X ray" [15 in 25,000-volt] which appears to be concentrated in a latitude of about 65 to 70 degrees, in the region of the Aurora Borealis.

Big Enough to See

Satellite size will be determined partly by the smallest size which can be seen at night, Van Allen said. He reported that a 10-inch diameter satellite, when located near the horizon at sunset, will reflect sufficient sunlight to appear twice as bright as the faintest star visible to the naked eye.

On this basis, Van Allen predicted that the satellite vehicle would measure two to three feet in diameter and weigh 20-30 pounds. Its shape might be spherical, conical or rectangular. It would be about 10 inches in thickness and 10 in. long. Such explanation, however, is so short that perhaps only "as measured and widespread" can be used in the upper atmosphere.

Date Collection Problem

"A major portion of the entire satellite undertaking" is the problem of observation and telecasting of the satellite's vital scientific measurements, Van Allen explained. The satellite (in present proposed) will make one revolution around the earth every 90 minutes. However, a number of scientific instruments need to be carried with the satellite and the vehicle's motion, the satellite will sweep past a different portion of the globe during each successive orbit.

Because of the modest amount of electrical power available for the satellite to operate its monitoring instruments, 500 ground receiving stations would be required for continuous global coverage.

The required number of ground stations could be greatly reduced by launching a radio carried with the satellite to cover over 90 minutes, providing some lightweight sensors can be found to make reliable measurements between solar transits.

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ADVANCED VERSION OF VIKING II (left) will be the forerunner of three-stage rocket to be used to put the U.S.'s earth satellite into orbit. The satellite will be built by the RAND Corp. The first stage will consist of solid-propellant rocket motor, the second stage will be liquid-propellant, and the third stage will be solid-propellant. The satellite will be 10 inches in diameter and 10 inches long. The launching site is White Sands Proving Ground, N.M. The satellite's second stage motor will be designed by Avco General Corp. The third-stage motor has not been selected.



LONG BELTS OF 20MM ammunition are loaded into F-100 (left) during Exercise Saginaw maneuvers, for which the 479th Fighter Day Wing managed to merge together two F-100 squadrons with the necessary ordnance (right), spare and diluted maintenance can-



F-100 FWDs feel maintenance patch through loss of flying time, although they must have more cockpit time than ever before

Shortage of Maintenance Personnel Curbs

By Claude Witte

Potter AFB, Tex.—Operational capability of U. S. Air Force's first fighter-bomber fighters, the North American F-100 Super Sabre, is seriously handicapped by USAF's lack of skilled maintenance personnel.

At headquarters base of the 450th Fighter Day Wing, Aviators Were Learned:

- Literally millions of dollars worth of our fastest and most potent weapon systems are idle on the runway in "double stop" status. This means they are given weekly ramps to keep them ready for action, they are not "packed" and can be put into action quickly, but there are not sufficient ground crews able to keep them operable at all times.

- Pilots of the 450th, among the best in USAF, are not getting down full quota of flying time and are disgruntled with the situation. The training program, however, is continued inten-

tively at the stage. Flight personnel are absent from the earlier North American F-86 Sabre to the F-100C fighter-bomber version of the indigenous aircraft.

• North American Aviation, managing over 90% of the F-100, is seriously concerned over the grounding of its newest product. The company has 35 of its own maintenance bases under contract with USAF to help train related personnel in maintenance of the new plane.

- A senior but less senior subscriber came to George AFB, Calif., where the 479th Fighter Day Wing, operates the F-100A day fighter version of the Super Sabre. The maintenance has 17 mechanics at the bar. The wing assigned to provide 16 mechanics of F-100s for training with the Aviators' fourth Air Army, Exercise Saginaw, great Avian-Air Force maintenance held last month in central Louisiana.

- Tactical Air Command is putting its maximum effort into its maintenance program, seeking to upgrade all personnel from the earliest North American mechanics are working with North American Operations Training, a strength-oriented school of both classroom work and on-the-job training to improve maintenance capability.

New Complications

Col Joseph Marion, commander of the 450th, told Aviators Witte his wing is almost fully equipped with F-100Cs. Aircraft have been delivered on schedule since last July, which marks the point at which the unit started to find the personnel pinch.

In replacing the F-86, initial table of organization for the 450th has been revised to keep up with the increased complexity of the aircraft. At the present, it requires 1.9 men instead of 2.1 to keep each aircraft in flying condition. With expansion, that ratio will decline.

• Pilots of the 450th, including Lt. Col. Herbert Stein, operations officer

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for the 322nd Fighter Group, point out that in the shift from the F-86 to the F-100 the 450th acquired twice as much sheer weight and about 10 times as much weight.

In addition, there is the added cost of maintenance. At the present rate of one flight, four combat system, fuel, maintenance and even rock debris on the advanced gauges lead to the extra new maintenance problem. The F-100's drag chute for landing is Pratt & Whitney J57 jet engine with three turbines, two compressors and three-stage exhaust can cause new problems for the ground crew.

At the Pentagon in Washington, the picture was enunciated by Brig. Gen. Albert G. Haworth, USAF's Director of Maintenance Engineering:

Reasons for Problems

Gen. Haworth complained to Aviators Witte that the problem of maintenance skills is far from off now, as the ground and flight crews go through transitions to new equipment

but said, however, that the problem has been especially critical in recent months. Here are some of his reasons:

- Fiscal 1958, which ends in June, is the end of the post-war era for USAF according to the accelerated conversion of Korea, buildup. Large numbers of highly skilled men have been returning to civilian life and it will be some months before this starts increased recruiting effort is felt. It will still mean a leveling of strengths and an overall improvement of the skill level.

- Industry is competing heavily for the services of skilled airplane engine and electronic repairmen. North American mechanics working at Foster and George report substantially lighter workloads than in the past.

- In the post-Korea period there have been major gains in the state of the art. Gen. Haworth points out that at World War II USAF could make good airplane mechanics out of raw bone with grade school education. Now USAF must start with high school

graduates who at times maintenance problems) for modern weapon systems. In addition, it takes longer to develop the skills.

• Increased complexity of the aircraft. For example, a flight on a 100-hour mission needs about 90 hours of ground work. The corresponding figure for the F-100D was 95 hours and for the World War II F-51 Mustang, it was only 13 hours.

- In shifting personnel from unit to unit, USAF must consider priorities. Tactical Air Command does not rate as high in the Strategic and Air Defense Commands. Within TAC, men headed for overseas service have a priority over those based in the continental United States.

- Fast rate of aircraft delivery to the post-war USAF forces toward its 117,000 goal has added to the maintenance personnel problem.
- The F-100, left of the country's superpower fighters, is drawing many reinforcements from units that have flown



SUPER SABRE pilots are enthusiastic about plane's performance, but its expediency is hampered by lack of maintenance personnel

F-100's Operational Capability

jetison-engine planes. Those men can be trained only on the F-100 and the program to give them proper skills had to be given to deacons, which started last summer.

Gen. Hewett believes it would be possible to keep all F-100s flying at the present time, but that there would be sacrifice in economy and safety. He points out that the newly-developed wings can fly one aircraft for 10 hours a day, but deacons believe that they can two planes for five hours each.

TAC's two top experts, Operations Testor and George Air Force Base, Mississippi, personnel selected under three grades X, S and T. According to Col. Milner, the skill requirement of the F-100C is high enough that each new crew should be a grade T man who is a technical or master sergeant.

Training with a specialist can take 3 to 4 years. Result is that it is a rare procedure when such a team is available and its 4-year commitment "must make up for the time lost and their worth with USAF."

Operations Testor is producing results, according to USAF, but some of the high-skill workers it produces are diverted to civilian assignments or other commands with a higher priority.

New Data Delays

Taking care of the F-100's more than 37,000 lbs of hardware is not the only difficulty encountered in introducing the plane to USAF crews.

There is a constant lag in achieving data and orders. This results from the fact that both versions of the F-100, A and C, were put in the hands of operational crews before all testing had been completed. The day fighter completed its operational tests in August and up until recently the stock level of spare parts had been based entirely on speculation.

The situation is being corrected as the logistics data become available for that version. The F-100C fighter-bomber version still has not completed these tests to determine logistics needs and the spare situation is even more dependent on figures provided for the F-100A version. However, the C model has no differences, particularly in the area of weapons, where sound technical data is lacking.

The delays in providing this information is accompanied by slow issuance of maintenance handbooks, which contain considerable detailed data. Operating units are forced to work out their own inventive plans to work out overhang periods, spare part needs and combat reliability.

In Washington, USAF planners pointed out that "least or fastest" is in conflict with the introduction of new

equipment. In developing space requirements for early operation of a plane such as the F-100, cost considerations force use of the most conservative possible estimates.

For a World War II airplane, defense parts were ordered with the utmost. Today's expensive components make this policy impossible. By 1963, headquarters says, the space requirements will be an average and the economic optimum development resulting from these parts will be used.

Fighters are of the F-100C are considerably short their engines, but constantly emphasize that it calls for

more skill. This goes for pilots as well as maintenance men.

USAF's Training Command is being forced to improve the quality of its files, give them enough experience to qualify as professional fighter pilots before they are assigned to the F-100.

In their everyday work learning to operate as a group, they fly as fast as Col. Milner's team set a world record speed of 123 mph in the case of the F-100. This kind of operation, with landing speeds of 185 mph, that requires no landing distance, calls for more cockpit talent than ever before in the history of USAF.

Lockheed Missile Scientists Quit

Los Angeles—Lockheed Aircraft Corp. last week announced that 15 scientists have resigned from its Guided Missiles Division in a policy disagreement over whether scientific personnel should have a controlling influence on projects fundamentally of a research nature.

Lockheed management and the negotiations, most of which became effective January 1, will not specify the specific cause.

"We are not making very much of this controversy," a Lockheed spokesman said. "Work will continue as before. It is a small point in our lives in view of the fact it involves only a small handful of people."

Meanwhile, informed sources here say there is a possibility that the dispute will spill into the news.

To Gen. H. K. Knobbe, director of the research laboratory branch, who headed the list of resignations, was in Washington to report on the dispute in the missile department.

Knobbe's resignation followed by a number of resignations at Lockheed's Orlando to which the bulk of current negotiations can be tied.

The resignations are believed to have been the result of a company statement of loss of authority on a new project. The accurate fill the news papers put them in a secondary role.

Dr. Louis A. Ridderus, former chief scientist for the Air Force and member of Lockheed's Missile Division for the past year, was appointed to succeed Knobbe, Lockheed announced.

The company released the names of six of those who quit.

Dr. Matthew H. Johnson, director of nuclear laboratory, Dr. J. L. Beers, director of computers and control laboratory, Dr. Eric Danned, head of systems laboratory, Dr. H. H. Held, assistant head of nucleus division; Dr. Wayne laboratory head-computer and control laboratory, John Austin, research scientist, computers & control laboratory.

The resigning scientists plan to form a new company, with headquarters in

Scientists Quit

Van Nuys, Calif., to handle consultation work is guided missiles.

Lockheed has been swamped with applications for new people. By the middle of last week Lockheed already had received 113 to 140 applications for hoped-for replacements. The company said it has more than 2,500 people to enable work and replacements will be made from both the California and Georgia plants.

In a memorandum the company explained the negotiations this way:

"The question involved in the matter is which the research laboratory should operate within the division. That is, is it its private side? It amounts to whether the research laboratory should have a controlling influence in projects which are fundamentally of a research nature. Top management said: 'No'."

Essentially, this would raise the research laboratory a kind of senior organization to be called in for help when problems arise.

It is believed there are two ways in which a complicated research and development project or missile system work could be handled:

• Projects managed by a group after which the scientist laboratory and flying test facility assistance when problems arise where the help is needed. This, it is said, is the way the Lockheed top management intends to run the division.

• Control of progress from the outset could be in the hands of the research group for those weapons systems in which the skill and knowledge base know how to develop the existing technology of the art. Johnson and the scientists feel so strongly in favor of this that they could not go along with management.

Another spokesman for the remaining scientists said that the highly skilled scientists are essential to today's and tomorrow's weapons which are becoming a character. Everyone knows, he said, maintainability or know-how weapons require a technical know-how outside of the straight armament field.

The resigning scientists plan to form a new company, with headquarters in

Wrangle Looms Over Defense Budget

Washington—Defense Department's fiscal 1957 budget battle is shaping up as the hottest wrangle since former Secretary of Defense Louis Johnson took the military funds after World War II.

Johnson indicates defense expenditures will be raised instead of lowered and the emphasis as on power will not be slackened in fiscal 1957. Aircraft procurement will continue at a high rate. Research and development, particularly for missile projects, will get better support than ever before.

This time the nature of the conflict is different from the pre-Korea days, but it has similar military, political and financial aspects. Feelings are high; the times are more critical and the national armed forces feel their pride is greater.

* * * Those are strong indications that the defense expenditures will be larger than Secretary Charles E. Wilson's goal of \$34.5 billion. Despite pressure of Test or Secretary George M. Humphrey, who wants the GOP to offer a balanced budget for political reasons in 1956, Pentagon experts believe it will be impossible to keep expenditures below \$35.2 billion.

* House Speaker Sam Rayburn was asked last week whether he thought the Administration is spending enough for defense. He replied: "Yes, I think the Democratic party is right."

So far as the Air Force is concerned, reliable sources say Capitol Hill still has only 100 total votes for the 1957 budget, up 5700 million dollars from fiscal 1956. At the Pentagon, officials will talk publicly about the program, but Defense Comptroller W. J. McNair detected, "a steady upward pressure on expenditures."

Much as the GOP does not want to pass the bill, Democrats are not expected to let it die at the committee stage, despite pressure to do so.

* Despite the official silence of the military at the start of budget discussions, there are "slurs" both from men and women. The Army is fighting hard for its munition and missile programs and claims it has been treated with the Navy to push a shipboard ballistic missile system of intermediate range. USAF is seriously concerned about pressure to stretch aircraft deliveries at a time when in top staff members believe the present 175-wing goal is too low and performance of the intermediate bombers cannot keep pace.

Spurred by Army's obvious success over the improved missile program, Secretary Wilson said the time has come in the long and intermediate-range programs alike if it is necessary to expand development and testing facilities.

The Army is related to two other areas, with the Glenn L. Martin Co. and Convair, in development of aircraft to be powered by atomic power.

One believes that the threat of global war has not diminished in the post-war era.

Secretary Wilson's statement was interpreted as a indication that the Defense Department has been trying to increase its procurement power and facilities in war as well as peacetime. He is known to favor competition between the services but there are mitigating factors, including some passed out in 1953 by the Hauser Commission when it spoke out against duplication of effort. An additional matter of concern is Secretary Wilson who has inter-service working groups to contend with, as the Army's desire remains to stay in the missile power, even when the range of their weapons appears to exceed USAF's needs.

Secretary Wilson is in some respects the most vulnerable. He has two major areas where he is being pressed to curtail spending from the fiscal 1956 budget. He is pledged to keep spending at a pace that will allow a 135-wing Air Force by June 1957. He is under close scrutiny on Capitol Hill, where he has learned to suspect the openness and ability of some well-known Democratic Members. Most recently he was forced to deny that any of the additional funds for missile work come from cancellation of aircraft procurement.

* * * Russian Threat

Gen. Nathan Twining, USAF Chief of Staff, is reported about to issue the immediate 157-wing goal. In addition to a large Air Force, he believes that is a serious crisis developing for lack of funds to maintain modern weapon systems. Without cutting the rest of the Pentagon's 1957 Work Plan, he, for example, appears to be down in tonnage \$200 million on the basis of the latest contract and aircraft availability during December. Budgets were reported earlier (AW Dec. 17, p. 9).

Air force morale also is high as the F-100, now powered by turbojet engine, the B-57, the B-47 and B-57. A new Bell utility Sabrejet has been designed for Army use. A version of the turbine-powered XB-47R was due closed last month (AW Dec. 5, p. 10).

Aide to the chairman of the Senate Armed Services Committee, Sen. John Sparkman, has a high view of the Air Force's morale. Now is placing its bets on the nuclear-powered mobile fighting force. It announced last week it is preparing to let a study contract to Allison Division of General Motors for work on nuclear power for Strategic Air Command planes.

With the recent test results of a missile fleet capable of launching missiles 1000 ft with nuclear power, will be explored for its advantages in delivering atomic weapons without depending on land bases.

Nuclear Power Contract

Allison Division of General Motors Corp. will have a contract with U.S. Navy calling for a study leading to "application of nuclear power systems to Naval requirements."

The study is related to two other areas, with the Glenn L. Martin Co. and Convair, in development of aircraft to be powered by atomic power.



LOW-ALTITUDE night photograph of Dayton, Ohio, residential section. Only illumination used in the experiment was those mercury arc lamps mounted in nose of C-47.

ARC Lamp Utilized In Night Air Photos

A new night aerial photography process which produces continuous, high-intensity illumination has been developed by the Air Research and Development Command.

The new method, developed by ARDC's Wright Air Development Center, utilizes a commercial-type high-intensity mercury arc lamp to provide a narrow, directed beam of continuous light. Present night photographic systems use flash bulbs or fiber cartridges that provide intermittent light.

Standard flash bulbs and cartridges provide a broad field, covering a fraction of a second, and illuminate light at all directions. Use of the mercury arc lamp enables Air Force reconnaissance aircraft to "see" light along the ground beneath the aircraft.

Air Force engineers at WADC's Aerial Reconnaissance Laboratory pointed out that use of the light eliminates the need for heavy, bulky equipment and with permanent lenses, is much less expensive, and also safer, since no explosive materials are required.

Although the active element of the mercury arc lamp is no longer than a cigarette, it produces enough light for aerial photography. The light is deflected in arcs from the ground because of their narrow beam and brilliant light. On an approaching aircraft, the light appears at a distant site to ground observers.



ENGINEER HOLDS the bulb used in mercury arc lamp night photo dimension specimen shown here installed in C-47 nose.

XH-17 'Flying Crane' Testing Completed

Culver City, Calif.—Three years after its first flight, the Hughes XH-17 Flying Crane has completed its test program and proved the feasibility of pressurized, high-speed transports for heavy cargo over long distances according to an announcement by the Aircraft Division of Hughes Tool Co.

Earlier this year an Air Force contract

engineer has picked up a trailer van, largest object ever lifted by rotary wings, the company said. It did not announce how heavy the van was, but said a helo capable of lifting the XH-17 design could carry loads of some 10 tons.

For another use, the company says an aircraft of this size would be used to lift a pad with 7½ trapez and their cockpit equipment, a 15-ton howitzer, a 2½-ton truck, a bulldozer or an assembled bridge.

Hughes engineers found they could increase blade life and reduce stress by as much as 10% by bolting weights onto the blade at strategic points. Blades on the XH-17 are 130 ft in diameter.

In the recent Hughes tests, they were flown in excess of 70 miles at 3000 ft, lifting a gross weight of more than 10,000 lb.

The XH-17 is powered by two modified General Electric J35 turbines, driving gas under pressure to tip buckets on the rotor blades.

Second SeaMaster Ready for Taxi Tests

Second prototype of the Martin X9PM-1 SeaMaster jet seaplane which exploded in mid-air recently (AW Dec. 15, p. 7), will be ready for taxi tests in late December.

Navy Under Secretary Thomas S. Gates Jr. and last week the Navy's general manager with the program and testing, "every confidence" in the aircraft.

Gates and Capt. Alan J. S. Russell, Chief of the Bureau of Aeronautics, inspected the second SeaMaster at the Martin plant and delayed operations for the first plane, which crashed in the Potomac River.

No explanation of the accident has been announced, pending reconstruction of the wrecked aircraft.

Air Force, Navy Obligations Slump

Air Force contract cancellations during October for aircraft and related items amounted to \$194 million since that time contracts for Navy had cut obligations only \$7 million in the same month.

Totals obligations for both services since the start of Fiscal 1966 on July 1 is \$61 million. Air Force shows a minor obligation of \$224 million.

USAF now has an unobligated balance of \$10.5 billion and the Navy has \$13.6 billion.

Expenditures during October were \$694 million for the Air Force and \$134 million for the Navy. Expenditures by both services since July 1 amount to \$2.5 billion.

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Lockheed Special Projects Group Speeds Airframe, Systems Design

To meet the fast-growing demand for rapid development of prototype aircraft designs and special vehicles, Lockheed Aircraft Corp.'s Atlanta (Ga.) Division has established a Special Projects Engineering Division within the Engineering Branch.

Starting with about 30 engineers and designers drawn from other phases of Lockheed's engineering activities, the new division will add another 100 next month, structural and avionics specialists within the next year, in the types required for the initial design work to become available.

New Projects

The importance placed on the Special Projects Division is indicated by the

work already assigned there:

- Experimental design development of an advanced landing gear applicable to future assault and cargo aircraft.
- Research and development of refueling systems, fuel protection approaches and multi-purpose fuel tanks.
- Design of specialized aids for special missions planned for the C-141 Starlifter.

Lockheed's Georgia Division was established only in 1971 to operate Government Aircraft Plant No. 6, at Marietta. Initial work was the "de-mobilization" and modification of 120 B-52 bombers which had been in long-term storage at Dyess, Tex.

Then a production contract for B-57 Stratojets was obtained, which still en-



Bell 47 Helicopter recently saved the Spokane government \$300 and a week's time by flying a portable fine-mesh barrier to a landfill power project.

Helicopter Airlifts House



Equipment built over snow-covered, impenetrable terrain included a complete kitchen

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gives about half the division's 19,000 employees. Since early 1954 Lockheed has performed an IRAN (impact and repair as necessary) and modification program on B-47s. This has included some special project type of work where only a few planes were affected by specific modifications.

Lockheed Martin's development has been at a maximum and has included four model builds (one of other major aircraft manufacturers). First the plant was engaged in the modification and production of aircraft designed elsewhere. This caused the production design and manufacture of the C-130 which was originally designed by Lockheed Burbank which also built the prototype.

Now the division has developed full engineering capabilities, including lead and staff organizations for project designs, structures, dynamics, production design test laboratories, flight test, new technology, operations research, performance design and special projects.

Broad Capability

The function of Special Projects Engineering is broad. Although primarily charged with design of experimental aircraft and components, it has the capability for basic development in avionics, structures and mechanical devices. The



P-51s Jet on C-46 Wing

Unusually P-51 Mustang aircraft engine is shown mounted on the wing of a Douglas A-40C Colossus C-46. This is the first time an installation of this type has been made in passenger service by a U.S. manufacturer. It was, according to a U.S. Army Air Corps spokesman, the first jet plane to land in America. The engine's body under skin was developed by the French firm, Sicoar. In general, engine's construction from is machined in flight. L. B. Smith is installing the P-51 engine on P-51B which is being modified to passenger configuration for the trans-Colombian service. The main units together with the plane's regular PR-AWA R-2800 engines give the C-46 a total of 2,400 hp for takeoff at 12,000 ft. High Register, United Industries at Columbus.



No Flat Spots, says Hy Trol

Let's get away from contemplation of the fastener a minute. You'll probably hate us for it, but we want to discuss the one thing that damn doesn't have—stainless steel.

You just don't get flat spots on them when Hy Trol's around. In one year's scheduled airline operation, the record showed that Hy Trol saved 50 percentage live removals for this cause on aircraft that relied on Hy Trol consistently during landings. (Northwest Orient, 1953).

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Hungry F-84F Thunderstreak

In Tucson, Saginaw's training version, Republic F-84F Thunderstreak slides into position behind KB-29 tanker plane.

objectives of the organization require the capability to:

- Design prototype installations and components which will be tested and evaluated for subsequent application to production aircraft.

• "Solemnized" design work required by staff and manager groups for their development programs.

• Under contract to independent contractors and designees, assignments involving design studies and/or hardware when not easily a part of a specific weapon system.

• Infrastructure, mate and develop engineers who, for background and workload reasons, are not immediately required in other Laddord units.

• Modify production aircraft for special trials requirements.

Special Projects-type operations provide significant economy in the range of prototype models at small production lots. Laddord's unique capabilities result from use of a streamlined design matrix which does not require many sub-libraries with IBM parts listing and production control methods. Elimination of unnecessary checks as much as arbitrary and design teams and the "bulldog" approach as individual assignments led by close integration of standard analysis and staff contributions with the design effort.

Follow-up of experimental parameter tuning and laboratory testing is also performed by the individual designers.

At Lockheed he has had various project and special project assignments, most recently as manager of the Triplexity Bregis Engineering Dept.

The senior division and group engineers average 14 years active design experience. Some of the men have had extensive experience with Tempco materials and assembly techniques.

A favorable combination of talent

for special project design results when European and American approaches are married, Laddord says.

How It Works

These infrastructures and environments do not mean a lack of schedule control and project coordination. Work on special projects is instated by a Project Schedule Plus. Technical scope and ground rules are laid out by a Special Projects Division Manual which is developed in concert with the basic approach of "Trust."

Weekly project meetings between all design organizations, management, design philosophies and plan detail review assist and that can be maintained. Schedule can be set up to support a job-flow pattern that requires a job sheet the day ahead in behind schedule position for each job.

The division is headed by W. B. Johnson, who joined Lockheed's California Special Projects organization 10 years ago.

Johnson was educated in mechanical engineering at the University of North Carolina. For 20 years he has been engaged in the prototype development and design of all sizes of aircraft



AS TACTICAL TRAINING COMMAND T-33A approaches flying boom (above), pilot opens wing fueling point. Boom operator sits home (below). TAC's KB-29s will soon be replaced by probe-and-drip KB-50s, and Thunderbolts will be modified to conform.





JACK & HEINTZ A-C SYSTEM

First Thermal Class "C" A-C Electric System to be put into production

With flight performance and punching power making it one of the world's most advanced interceptors, the F-102A imposes economy-affecting requirements that test the limits of the new military Class "C" specifications.

To insure maximum available electric power under these severe conditions, Jack & Heintz developed an a-c system distinguished by several engineering achievements:

- First heat-treated generator ground completely capable of meeting normal and overload requirements at a reduced temperature to 120°C. assures high efficiency, low harmonic content, unusual phase balance, very light weight.
- First Hi-Pass® voltage regulator protecting against phase overvoltage caused by asymmetrical fault conditions, including open series lead. State-of-the-art semiconductor technology.
- First control panel using a new gas-discharge over-voltage detection rate insensitive to acceleration.

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POWERS CONVAIR F-102A



These photos taken on the F-102A production line at the Convair Div. of General Dynamics Corp. show the three Jack & Heintz a-c system components in process of installation. The

generator shaft mounted with a Sundstrand constant-speed drive is located in the aft fuselage. The control panel (center) and voltage regulator (right) are mounted in the ship's nose.

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AIRCRAFT EQUIPMENT

Fairchild Builds Short-Take-off Transport

By Robert H. Godman

Fairchild Aircraft Despite his arrival a 40-year-old concept to provide a relatively fast, short-take-off transport designed to meet the needs of modern warfare.

In the event of such a war, the need for flexible movements of troops and rapid evacuation of civilian would call for a load carrying plane in fast and a modern transport and almost as versatile as a helicopter.

Fairchild's first step in providing such a transport is the building of the M-212 test vehicle, which has been 80% assembled at Maryland, Md. This experimental craft will demonstrate to what extent certain improvements in wing deflected propellers as aircraft developed by William E. Hunt can be realized in a modern army transport plane. The August design was awarded by one of his patents (No. 2, 150, 615, Aug. 25, 1955) by the owners—Hunt, the Wiggin-Hunt Engineering Corp., of Norwood, Mass., and Eugene A. Hosquino, of New York City.

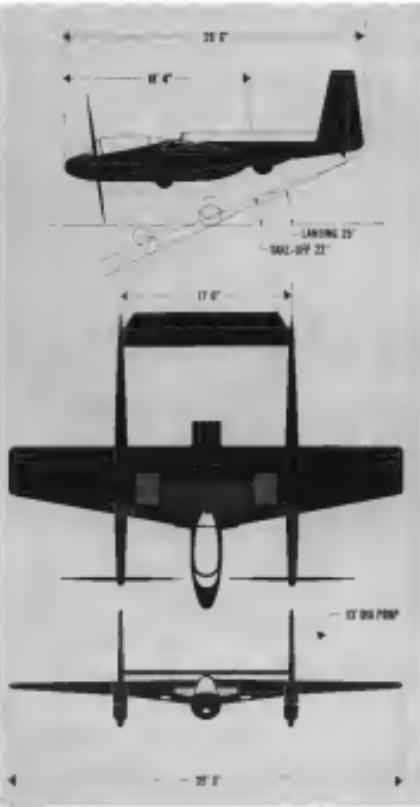
Performance objective for the M-212 project is to produce a plane that can get in and out of a 50 ft clearing over a 50 ft distance and then cruise at a speed comparable to conventional transports. For the M-212 demonstrator this will be 240 mph. See Fairchild hopes these future STOL aircraft takeoff and land in 100 ft and go over 200 mph. The M-212 will carry an undervisible belly pod capable of carrying eight men or four 140-lb. cases.

While this particular STOL resembles Fairchild's C-119 in appearance, it weighs only 7,000 lb. and its relatively larger propellers are mounted out well ahead of the wing. Even at low speeds, the 300-hp power-pack-driven propellers (two Lycoming T-53-1520 engines) develop air over most of the wing. At the same time, the trailing edge flaps can bend this flow down, converting into considerable lift. The same propeller accelerated mass of air which ordinarily produces forward thrust.

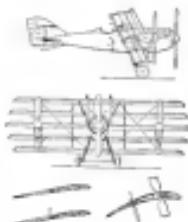
Towing-Vane Wings

The wings, therefore, act as conventional vehicles for flying high-speed flight, but they are mechanically adapted into something more like the towing-vane for bending the air up and down flight.

Although Navy pilots in high-speed propeller-driven planes, have been an-



FAIRCHILD M-212 test vehicle designed for short take-offs and high speeds.



EARLY SEMI-HOVERING model was incorporated in 1957 patent of Dr. A. Zabel.

tegrating this into a number of veins by using engine power to shorten these earlier designs, the concern's attempt to copy the Cessna 170B and Bellanca helicopter may have had only limited success. This design is another U.S. attempt along with the Ransome Skystreak and Prof. Otto C. Koppen's Heinkel, designed to measure some of the objectives in STOLs.

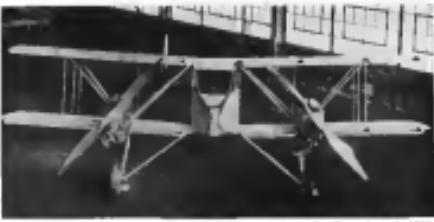
While Fairchild is withholding most details of the M-212 until after the flight test evaluation, more of the cockpit features may be disclosed from the inventor's patent and a second lecture given before the Washington section of the Institute of the Aeronautical Sciences by R. A. Dreyfus, performance design engineer of Fairchild Aircraft Division. They include:

- Propellers placed well ahead of wing and fixed discs.
- Large propeller blades which are both pitch and flap and flap after the fashion of helicopter rotors.
- Interconnected propeller drive shafting with overrunning clutches.
- Full span trailing edge flaps.
- Full span leading edge slats.
- Spoliers for slow-speed lateral control.
- Active aerodynamics intended to increase the aerodynamic efficiency of the thrust bearing propeller and save importantly in climb rate, center-of-gravity and control surfaces during the "low and slow" take-off and landing phases.

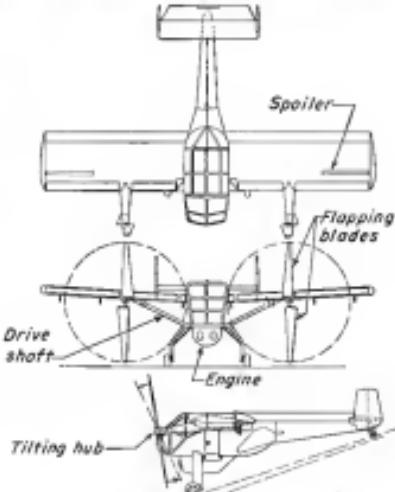
Hunt's Contribution

Hunt, who is now acting as consultant on the M-212 project, says in his patent that he has made certain improvements on the Douglas, the Cessna and the STOL type of the early 1950s.

Hunt says that in the Douglas, the Douglas had very bright and important. Despite several basic reasons for lack of interest in the project, one advantage is a means in that the Douglas could make 30 ft ground take-offs and landings. Observers say that while flying as slow as 16 mph, the aircraft



GROUCHO-ROLAX SEAGOMFLY (above) with successful short take-offs in the early 1950s.



PATENT DRAWING (above) by William E. Hunt of M-212 design.

could go up and down at 10 and 70-degree angles. The aircraft had no transverse trim or roll control, and in the center of the aircraft was a large vertical stabilizer.

The third is the aerodynamic difficulty of placing the propellers at least one-third of the chord ahead of the center of pressure of the wing.

Since, the low-speed propellers on one side cause the upward-down moving blades to go through the air at different speeds to match the same rate as helicopter rotor blades do when the helicopter is moving ahead, a number



FLY WEATHER-WISE

These weather items prepared in consultation with the United States Weather Bureau

TERRAIN

THE VARIOUS TYPES of terrain surfaces have a significant effect on the air masses flowing over them—with a consequent effect on the weather and plane performance.

One of the most spectacular effects of terrain on air currents is the Mountain Wave—a high-reaching deflection of the winds when a range of hills blocks a strong flow of air. This sets up a "wave" which may reach high altitudes and extend in a chain of waves for several hundred miles downstream. The Lennard-Jones Type Standing Wave Cloud identifies these large waves. Even small ridges may create waves and produce dangerous down drafts on the lee side (see diagram at right).

Care should be taken in approaching a ridge into the wind, because in a low-powered plane the down draft may make it impossible to maintain enough altitude to clear the top. Also, when taking off on a runway toward a hill, be prepared for a decreased rate of climb if the wind is coming over the hill.

When flying in the vicinity of mountain tops, the possibility of altimeter error is important. Two journey factors can cause errors to indicate higher altitudes than aren't. Low-level pressure caused by dissected flow on the lee side and abnormally cold temperatures. Conversely, they can produce errors as much as 1000 feet.



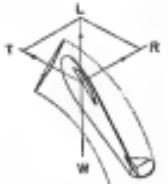
Best Pair to Get You There!



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STOL FORCE VECTORS explain need of steep climb angle. Dotted lines show projected airspeed boundaries.

Flapping lift has been provided as the primary source of lift for the STOL aircraft. Dotted lines show projected airspeed boundaries.

Propeller Shaft Axis

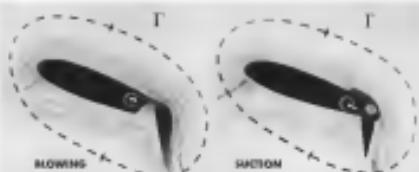
The propeller shaft axis angle which must satisfy the two wing deflection modes of flight proved so important in previous strengths that the Bölkow patent provided for a pivoting engine nacelle and that's improvement called for a completely tiltable propeller hub.

In the time being, the M 251 problem still awaits with fixed propeller shafts, however, one of the designers says there is room for a tilting hub should flight test indicate such a need.

One reason for the negative pitch in the propeller shaft is the desire to shorten the relative positions of the propeller, wing and tail control surfaces as compared to what was done by Bölkow as the Dragonfly project—the combination of corner low-lift having effect. The pitch has to be great enough propeller-wash past the tail control surface at low speeds when most of the propeller thrust is being deflected sharply down to the vertical range.

In the 1951 patent of Dr. Alfred F. Zehner (See Fig. 7), the proposed solution was to move the aerofoil of the wing in the side of the outer propeller ring bearing. Slow speed lift was sacrificed so that some propeller wash could reach the empennage. In an early article on the subject, Professor T. H. Nation who became interested in STOL, from the study of birds suggested a hinged fuselage so that the tail could be moving down into the deflected blade (Aviation Eng. Sept. 1, 1950, p. 30).

To overcome the difficulty of fuel placement on the side of the STOL control fuselage, the fuselage carrying the plane while in the STOL regime must be considered. Unlike the other two areas being discussed in this case seems when the STOL craft is used sharply up with drop down with propeller blade (2) and wing flap reaction (3) carried each other at the horizontal dimension



FORCED CIRCULATION, such as the proposed blowing and suction methods illustrated above, may provide better performance in future STOL aircraft.

In the present, the data are shown numerically linked to the trailing edge lift and the propeller lifting moment.

The speed of the propeller will handle lateral control problems to much the same manner as on the Helicopter (U. S. Patent 2,719,654, Sept. 27, 1953).

Other STOL Research

In addition to testing the Bölkow aircraft under STOL, Fairchild research under Frederick Wagner is investigating mechanisms of lateral circulation, working towards coefficient of lift as high as 30 (see diagram).

The speed of the propeller is used to alter boundary layer flow and increase the circulation thus, giving the results of these lifts are to compare with the vectorial diagram principle now used in the M 251 to further increase the plane's initial field capacity. But Fairchild indicated that,



British Merry-Go-Round

Designed in strict liaison engineering data under extreme maneuver conditions, this nose landing gearless twin座 aircraft modelled at the RAF Institute of Aviation Medicine in Farnborough. The controls, rated 60 ft. and 100 ft. to 1000 ft. in the air at 100 ft. and 100 ft. to 1000 ft., requiring forces up to 14 per cent of the subject's weight in the air and 100 ft. to 1000 ft., requiring forces up to 100 ft. A ground 1,000 ft. 60-motor controlled by asphalt down the runway up to 100 ft. from under the deck. While the aircraft is programmed through automatically supervised test cycles and monitored by a number of safety devices, sensitive instrumentation measures the subject's medical condition to the control room.

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- 1. Accuracy: ±0.5 to ±2.0% at conditions of test temperatures, 60° to 100° F., and pressures of 100 to 1,000 psia.
- 2. Accuracy: ±0.5 to ±2.0% at conditions of test temperatures, 60° to 100° F., and pressures of 100 to 1,000 psia.
- 3. Accuracy: ±0.5 to ±2.0% at conditions of test temperatures, 60° to 100° F., and pressures of 100 to 1,000 psia.
- 4. Pressure Ratio Range: 1.2 to 3.4.
- 5. Pressure Range (measuring): 100 to 1,000 psia.
- 6. Pressure Range (indicating): 100 to 1,000 psia.
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The Pressure Ratio System has a thrustmeter for indicating optimum climb and cruise altitude settings, whereas the Pressure Differential System has a distinct advantage at take-off.

Ballistic missiles never hear these seven words:

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PRECISION MANUFACTURED AND REFINED — SPECIAL EQUIPMENT AND SYSTEMS
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McDonnell FIGHTER XV-1 THRUSTMETERS
used on Convair's Y-300 and McDonnell's XV-1

whether or not diminishing returns of lift come with increased blowing, how much, length depends upon the particular wing configuration.

Goodyear Receives B-52 Subcontract

Goodyear Aircraft Corp. has won an unannounced amount of a multi-million-dollar contract for the construction of B-52 components for Boeing Airplane Co.

Under the long term contract, wing sub-sections, fuselage side panels, fuel and vent tanks, bulkheads and panels, stiffeners and fairings will be manufactured by Goodyear for Boeing's Semiconductor Division.

In addition, Goodyear also will produce spars and fuselage panels for Boeing's Wichita facility. All work will be carried out at the company's Elkhart Park, Ind., plant.

Space at the plant already has been allocated and rigs and fixtures from both Boeing facilities will be shipped there in the near future.

Aluminum Expansion

Kaiser Aluminum & Chemical Corp. is planning a \$250 million expansion program to expand its aluminum production in U.S. Subsidiaries made in 1965. Ground will be broken in April on a 320,000 ton reduction plant at Roanoke, W. Va., and a 750,000-ton smelter plant on the Mississippi River, Germany, La.



XV-1 Convertiplane Jet

Close-up view one of three pressure probes used for vertical flight of the McDonnell XV-1 convertiplane. Each of the three rubber-bladed tips on one of the McDonnell-developed probes fits atop the jet engine shaft. It is sealed by a disk-like flange after X shaft is inserted into the hub and then shrunk. These three Herion Stikko Co., maker of flistles, are the microphone array for shear force of its strength and high temperature characteristics—the pressure probe is subjected to 1,800°F during temperatures up to 3,500°F in the XV-1 and because it is easily sealed and freed.

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PRODUCTION



PICTORIAL INSPECTION Assembly is checked against labeled picture and instruction sheet; typical picture sheet shown at right.

Quality Control, Reliability Plans Bring Dividends to Eclipse-Pioneer

By Henry Lehr

Teterboro, N. J.—The Eclipse-Pioneer Division of Bendix Aviation Corp. is beginning to reap the benefits of a three-pronged attack on the problems of reliability and quality control.

The new program already has paid off in a sharp reduction in the number of field complaints of the company's gear, switches and instruments, according to Robert Novak, director of the division's quality control. Furthermore, the company can move faster to take corrective action when difficulties are discovered in the field.

The final bonus the company hopes to derive from the program is a head start on meeting requirements of future military specifications.

Combination of New and Old

Implementation of quality control in Eclipse-Pioneer is reflected in the precision nature of the company's products by. The division makes flight, navigation and engine instruments and components. Its military and avionics customers include automotive pilot systems, altimeters, pumps, compressors and various types of remote control and remote radiotelephone systems.

The three-fold program, which is in addition to the usual quality control procedures of our large production

plant, is a combination of the new and the old. It major facets:

- Product Reliability Laboratory, opened a few weeks ago whose equipment is being tested far beyond current military and environmental specifications, to determine safety operation limits and prevent possible design improvements.

- Pictorial inspection procedure, based on field service reports showing what the equipment should look like at various stages of assembly, and follow single-spectrum instructions.

In addition, a separate Service Inspection Group is asked to sound the alarm if field operations of any particular item go too high.



GYROSCOPE is adjusted during service run in its housing stand before shipment.

AERONAUTICAL WEEK, December 18, 1963

Helping Novak in the quality control effort is a staff of 492, keeping tabs on the division's 3,000 production employees.

Product Reliability Laboratory

This recently arrived department, under William Leicht, is not yet fully equipped. It already has in operation, however, a pair of environmental test rooms, walk-in cold-altitude chamber,走行, and vibration testing stands and various types of vibration equipment for qualification, life and reliability tests.

The laboratory not only gives tests on new developments, but also subjects standard Eclipse-Pioneer products to new, more rigorous conditions.

The tests are stopped before the point of failure, Novak says, more can be learned from analysis of the equipment while it is still whole. "Failure destroys the evidence, so it's looking for, he says.

Two important advantages have emerged from this program:

- Troubleshooting teams headed up by the test module check with actual trouble that occur in the field. As a result, Eclipse-Pioneer is able to initiate a series of corrective actions, or where reports from the field indicate the need for a change, the company can make it make the necessary fix faster.

- The tests establish the final limits of the company's equipment and show the design points which need revision in order for equipment to meet more rigorous specifications than now in place.

The environmental oven is a brain unit, each half holding three draws. It was built in Memphis by Eclipse-Pioneer's plant. The two thermometers only controlled oven chamber, are isolated from each other so that one can maintain a continuous temperature of 450°F. (the oven's peak) with the other at 100°F. for storage.

The furnaces are available. These ovens can be repositioned in them in the work benches and access can be through racks and trial out before the oven is loaded. Cables are brought out through insulated plug.

The lower furnace in each chamber is extremely low, less than 10 inches. It can take two pieces, assembled mounted on a Scrivelsby table, in the unit can be put through standard ranges to the oven to see how the drift and accuracy of the potentiometer is affected by elevated temperatures.

Pictorial Inspection

The pictorial inspection technique developed at Eclipse-Pioneer takes the old-style, printed check list as its point of departure. To this check list is added a photograph of the piece of equipment as it should look in the particular stage of assembly, with all parts that are necessary in the check list numbered and labeled (see photographs top of p. 36).

For instance, the old check list might have said, "Check three screws holding motor bracket to frame for tightness and for freedom of turn and double end of screw and insulation."



EXTRA-LARGE DRAWER In laboratory and test facilities equipped with stainless steel.



STANDARDS LABORATORY checks every assembly made in the plant taken a you

a complete lone-left manual is made up for the component. It consists of a complete series of labeled pictures showing the equipment at successive stages of assembly. Facing each picture is the appropriate checklist. Now, for the same operation described above, the check list says, "Check three screws (No. 3) holding motor bracket (No. 5) to frame (No. 1) for tightness and freedom of turn and insulation."

This seems simple enough, but it lent itself to possible ambiguities. Because the pictorial inspection might reasonably be construed with several different classes of parts. Further, when an inspector was assigned to a new piece of equipment, a fairly lengthy initial training period might be required.

With the pictorial inspection method individual inspectors do not come to the company, instead each those stages covering their particular phase of the assembly.

Engage Vetsch, head of the statistical quality control group and the pictorial inspection program, says that although it is still in its "swaddling



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"clothes" (measures for each floor of the company's glassopex have been completed since the program started in October) it is already paying off in better and more thorough inspection.

The company plans to catch up with all imported current production now, a job which will keep the department busy for many months and then move into preparation of imports for new items. If taken several weeks to complete a visual...

The actual inspection manual section works closely with procedures pursued in developing the books. Later, when they have caught up with the backlog, practical inspection people will sit in on pre-production meetings, with the aim of having assembly units when we start another production stage.

Standards Laboratory

Berry Decker, an old-timer tool and die maker, heads the Standards Laboratory. He brings to the lab the previous contacts of his former work, working in terms of sufficient and hundred thousands of an inch.

Each of the 700 standards master gauges in the plant goes through Decker's department twice a year for cleaning and inspection when annually. Decker puts a date tag on each screwdriver after it is checked, and the gauge may not be used beyond that date without a recheck. The tags contain more than 50 types of mechanical means for positioning and about 15 electrical-electronic standards. Decker has also the former group, and his contact, Nicholas Konarzynski, takes care of the latter.

The very heart of the standards lab is a set of Johnson No. 1A gage blocks that are accurate to within normal tools of an inch. These are used for checking A, B, C, D, E, F, G, H, I, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z sets. The A set is the lab's grand dame and the A set is the parrot. The remainder of the numbered gages in the shop are referred to as the A set.

The laboratory's very precise micrometer is one of only two in the country according to Decker—the other is at the Bureau of Standards. Both of the units were made by Eclipse Peacock.

Using the other precision gages in the laboratory:

- Visual gage, made by Sheffield, for checking taper plug thread gages accurate to half pitch at .00025 in.

- Toolmaker's comparator, made by Gaertner, for checking hole locations and sizes on gages, concentricity, thread accuracy to .0001 in.

- Micro-AC electronic comparator, made by Cleveland Instrument Co.;

New and Old from North American



F-84 FIGHTER-based Navy fighters nose down the final runway at North American Aviation's Arsenals, Elgin, Ill. Shown not in a Navy version of USAF's F-84 is the first Fury model to Wright J65W-1 of 7,000 lb. thrust.



SERVICE WORK F-84's are modified and overhauled at North American Aviation's Farness, Calif., Division. Following complete teardown, the plane is brought up to brief service standards. Shown is long-term protective covering from hot sun during the wait.

Valve Talk

for WM. R. WHITTAKER CO., Ltd.

by Marvin Miller,
Sales Manager, Aerobatic Whittaker Corp.



Power, drag and time are fast combining to build big head-
aches for equipment producers as well as aircraft manufacturers.

These, as you know, are the basic elements of the so-called "heat barrier," a misnomer, for it's no well-defined bar such as the sonic "wall." Rather, it has infinite depth under the immovable law that the faster you fly within the atmosphere—the longer you'll fly fast—the hotter you'll get.

Friction is the key word in the heat problem for airplane manufacturers and, indirectly, for equipment suppliers. Skin friction builds energy that is dissipated as aerodynamic heat loss, the heat from the very layer of air in immediate contact with an aircraft. Given enough speed and enough time, the boundary layer will transfer kinetic temperatures to the plane's structure by conduction.

The thermal pain due to this conduction is phenomenal, although unimportant at sub-sonic speeds. You'd need that extra heating equipment to dissipate the heat generated at transonic speeds. At 500 mph, for instance, you'd need about 100 extra hp hours. An air factor plane at 300 miles per hour will require a 10 degree increase.

At supersonic speeds, the same con-
ductive heat causes the insulation damage
of heat barrier stress. At sonic speed, for instance, Con A normal drag at 100
mph, would be 100 times greater than
at 500 mph. At 1.5 times the speed, at
Mach 2 there would be 1000 times
the drag and Mach 3 perhaps
1000 times more.

The increased stresses pose all types of problems for the aerospace engineer to avoid stress and strains, whipping and buckling, and to keep the aircraft constructible. His design must have a maximum of honest or smooth boundary flow rather than turbulent flow. He must also consider the effect of heat on metals and materials that will be less affected by changing temperatures, a whole new field of investigation. These factors have long been aware of the heat problem.

Present day designers must worry about fuel economy as much as ever but, in addition, they must be able to withstand maximum stresses. And they must face the varied problems of cooling systems to reduce the heat load. The PAF, like the F-104, has a system that reduces their own problems of weight and complexity.

But the heat problem does not belong to the aircraft designer alone—it belongs to the engine man, who must be able to cool the engine, who must come up with a better way to dissipate the heat. The compressor, the combustion chamber, the turbine, the nozzle, the ducting—each part of the engine must be able to withstand the heat without damage. All the improved parts that make up the "hot section" of the jet

can be made to 9300000 as
• Elastomeric, made by Tusing Equipment Co., tors spring elastomer.

• Universal pitch controlling machine, made by Sheffield, measures external and internal leads on threads and gears, accurate to .00005 in.

• Four edge granite surface plate, 16x16 in., made by Hermon Stone and Granite, and a Sheffield project stone lathe mill.

• Eryphonoid universal external comparator and a Pratt & Whitney standard measuring machine for external threads, plug, wire, both accurate to .00003 in.

• Indi-Ech electronic indicator, made by Cleveland Instrument, for checking tolerance outside diameter and gear end surface plate work, accurate to .000005 in.

• Coligraph square, made by Tuthill Peacock, for checking angle blocks, has parallel arms; the gauge is only .000002 in. off square to 12 in.

• Naval Observatory face signal receiver, made by Metronics Electronics Co.

• Frequency oscillator, made by Hewlett-Packard, precise within 0.3% at 500 cps.

• Vacuum tube precision testing tool.

• Master transducers.



Novel Incentive Plan

Employees of Topp Industries, Los Angeles manufacturer of aircraft instruments and components and division supplying the cockpit of a McDonnell Douglas Skyraider and Douglas C-47 and Douglas C-119 transport aircraft, will be faced with extra incentive distances for weight and size reductions. The type of the aircraft instrument dial that can be used to reduce the number of components required to assemble instruments. And this will continue until it is attained and tested to strict reliability under factory like conditions.

Any number of greater problems can be foreseen, with which it will be difficult to keep them past, since the cost of the aircraft will be increased by adding parts with no special purpose available.

The reduced 360-degree plus deflection angle of the dial will be the first. It can still cause performance problems. But special ways for even higher improvements will take advantage of the fact that even faster and the dial can be used in all cracks. The best is all.



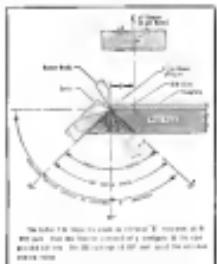
AUTOMATIC ROUTER used to machine variable angles at Commercial Works

Variable Router Uses Electric-Eye Scanner

A new automatic router which employs a photoelectric scanner to automatically machine variable angles is not in use at the Commercial Works plant of General Dynamics Corp. The new tool saves about 25% in manufacturing costs, Comair says.

The machine was designed to fit a slot in the plant's fabrication department where conventional routers were being used to cut the variable angles in stepped blocks. Blocky routing was causing a bottleneck in the production parts from sheet material.

Comair tool designers felt that conventional routers had much to be desired when it comes to machining a surface where the degree of angle varies. Furthermore, manual operation, the downtime to make frequent set-ups and laborious errors are costly items in the



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WHAT'S NEW

Telling the Market

Setting up problems for electronic computer programming is specified by new method developed by Hugo M. Marquez, methods engineer at Data File 170, Department NR-10, Beckman, Inc., 2220 Wright Ave., Richmond, Calif.

Comments and Test Procedure for Electronic Computer Data Lines is name of Technical Paper 441, available from Defense Technical Information Service, 9100 Mendenhall, South Pasadena, Calif.

Laminated metal, and less than may be applied in the electrical and electronic industries, are described in fact book available from Standard Metal Corp., 282 Broad St., North Attleboro, Mass.

Marking for airplane production of complex, special-purpose electronic cable is described in bulletin on Douglas Venture Path Planning Guide, Douglas Aircraft Co., Inc., 2200 S Figueroa St., Los Angeles, Calif.

Products Received

• Federal Aerodynamics, Head 146 (now) by Karl D. Wund-Pohl is the author, distributed by U.S. Naval Book Store, Ann Arbor, Mich. Textbook on aerodynamics for the engineering student or a reference source for the practicing engineer.

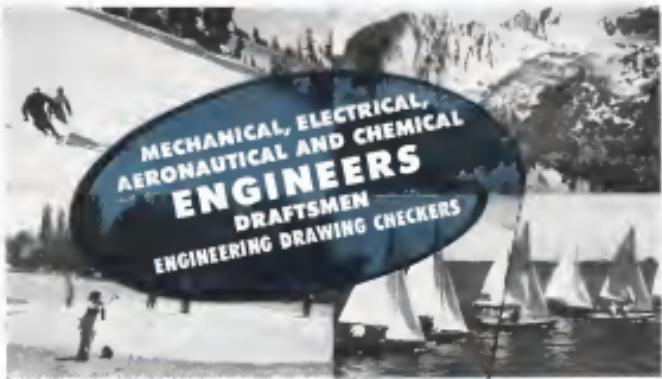
• Hydraulic and Pneumatic Operation of Machines—by H. C. Felt-Pohl by Philosophical Library, 15 East 45th St., New York 16, N.Y. \$7.48, 391 pp. Information on the use of oil or compressed air for driving and controlling machines and vehicles.

• Jet Propulsion: Turboprop—by Valence C. Felt-Pohl in National Press, 435 Aliso St., Palo Alto, Calif. \$5.50, 327 pp. Introduction to the theory and operation of turboprop engines.

• Technical Aspects of Air Transport Management—by R. Dean Spain-Pohl by McGraw-Hill Book Co., 350 West 42nd St., New York 18, N.Y. \$4.50, 316 pp. Airline management and the technical aspects of airline operations.

• Practical Air Navigation, Seventh Edit.—by Thaddeus C. Everts-Pohl by Associated Science, 1200 Prince George St., Annapolis, Md. \$3.90, 470 pp. Guide to all phases of air navigation.

• Introduction to the Study of Chemical Reactions in Flow Systems—by S. S. Penner—Pohl in Battelle-Mountain Scien-



Aerojet-General, America's leader in rocket propulsion, announces the construction of its new Liquid Rocket Plant near Sacramento, California. Devoted to research, design, development and manufacture of large liquid-propellant rocket engines, the new plant is the world's largest industrial establishment of its kind.

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Performance specifications, descriptions and applications have necessarily been limited by the space on this page. A full description and detailed specifications on the AmpeX 800 are available by writing Dept. QH-2242

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* LETTERS

An over rolling to match as much 1200 Bandolier Jars against the pair 850 mesh filled with gr copper and it was set about a few feet.

To install and the Navy's idea, we thought about the name of the "T-77," T-77, during the Korean War and thought that the P-512 and F-512 really did think the States was having its "long hard road."

I myself as a "McDonald" representative, was lucky enough to be the first to see the carrier F-512 with the Navy fighter squadrons 3, 4, 177, 4th in Indo-Brunei Harbor. This operation with Bandolier and a Grumman Sparrow with P-512 Jars, both made our landing assault force the most successful in Korea, 1951-1953.

So as an individual soldier I like to express my very respects about Navy and believe the revised cell sizes that in spite of all the hardships put in the way of a service personnel over located in Asia a great job done, but more and will be to ages of tomorrow.

Pat. Carpenter
Bell Aircraft Corporation
Buffalo, N.Y.

In Defense of Tacan

"An 'oldie' but a goodie." The large interest has been held on Tacan and the IFF which appeared in a recent issue of *Aerospace Week*. A sense of humor is always welcome, but this discussion would seem to indicate that the author does not know his Tacan and anti-facade (I think I mean a pin infarct) as a technical concern very well to be all the good. Yet one may be prompted to wonder whether plots of characterized aircraft and ground stations are being plotted in the same manner.

Tacan was originally developed to respond to the U.S. Navy's need and interest for an adequate navigation aid for carrier-based aircraft. Our brothers, sons and friends who work on Tacan are not anti-ground stations, nor do they have any desire to annihilate Tacan. They would like to enjoy all possible safeguards for their lives. Tacan planes may find themselves in areas where their instruments parts are not reliable. In the event of a continually changing and unknown location there are no fixed alternate landing fields so great speeds of land-type aircraft can cause potential and in some cases an aspect of difficulty. The USAF is at present in the process of getting their Tacan planes to drop tanks on their bottoms for land rights emphasis. The "smart" forces (I think) British Team, carrier aircraft pilot had an adequate field to project them to cover the area of the carrier and land on the sea after a carrier emergency so that they could navigate effectively and safely to a landing as well as navigate effectively in the performance of their assigned mission. Now with Tacan, these aircraft pilots have no such field. The problem comes from the development effort which started from a "bottom-up" design at IFF (International Telephone and Telegraph) as evidenced in several published photographs showing the Tacan antenna mounted on the top of the fuselage, the Sanders, the Intec and other U.S. Navy carriers. At the request not nearly a dozen, but a real contribution to military

aviation.

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• LETTERS

medium electronics, of which the engineer was not quite educated by his studies.

At regard civil airports at Tucson which seem to be in state of confusion, lost in closing a new field for thought (which would naturally also be set to motor). NASA has been in contact with several aerospace, equipment, aircraft landing systems, ground control approach systems, distance measuring systems, traffic control radar, radio safety factors, VHF radio transmission private use is done. Had no? The reason is that the day-to-day merit of these systems from whom gets to test and useful devices very large due to the longitude, latitude and performance of

the Tucson area. (2) This consideration has led us to first mentioned appear or develop in my or another state. (3) Civil aviation has naturally adopted their all with great benefit to itself. (Therefore, as many states, taking advantage of AIA playing around with the idea, the development of all products of the equipment which are now in world wide use).

Any one concerned about sensor which is used by these component is an augmentation for which has given me answer to the question, would there also take place damage put together. This perhaps, is a prospect which might be brought to the attention of your

eng and to the American public in general, when standard of living is largely the result of "table-top" economy.

Reuter J. Cates
116 Winter Street
Natick, Mass. 01760

On Proprietary Data

I have read with interest the article "Industry Wants Proprietary Data Policy" by Mr. Robert E. Beach in the September 16 issue of AVIATION WEEK.

The situation presented by Mr. Beach is as follows: Proprietary data is a valuable asset for which has given me answer to the question, would there also take place damage put together. This perhaps, is a prospect which might be brought to the attention of your

The basic fact remains that at controlling the research and development with industry, the Government is buying or not.

It is paying the full price negotiated and, in my commercial transaction, expects full role to play them for which it has paid so full. This is completely analogous to the system almost universal in industry whether, in consideration for the low cost of labor, the Government can buy skill and talent at a cheaper for a company which prove to be of a potential value, being in the company for my purpose & always would.

I realize that Mr. Beach in his paper, has said repeatly that he wants to protect his position at Air Force procurement in which, particularly, in the "competition designs" aspect, differs somewhat from the practice of other services. Nevertheless, policies, regulations and decisions are boundary conditions of the bargaining table. I think it is important to keep in mind that the Government, as indeed we both sides to discuss the terms and processes they desired advantages.

The lot of a contractor that the funds of the Government are spent on, in the course of a competition is understand able.

However, many novices have taken pains to allow these firms. For example, the Army Ordnance Corps in procuring guided missiles, in the early days of the missile design, for each contractor, whenever possible, will negotiate with the organization which performed or participated in the development. Yet it is difficult to see how the amount of expense is issued and it is not unusual for the contractor to come up short. Because the Government cannot assure compensation on an item if he bought and paid.

The tasks and expenses of industry are in stock in order to be purchased by the government, making the Government, as the primary customer, the major competitor engineers are. Indeed, it appears that the Government is ours. Much more intelligent that technical data generated under company funded effort is propagators who in the campaign, on the other hand, claim no expense development, if possible, can be performed at home, nothing on overheads.

I feel that the utility of technical data

• LETTERS

policy represents an incentive shadowed when viewed in the light of "Who is the Government buying?" It is a very delicate and gets different with climate change from time to time. The main point is to determine the status of the original of any, or before the original is signed.

Stanley Rabinovitz
1015 First Avenue,
Bronx 6, N.Y.

USAF Engineer Policy

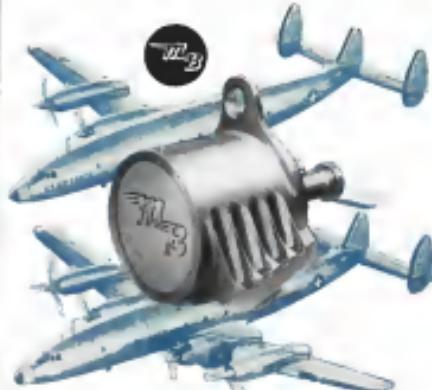
In a recent issue a planned one has flight A-3, first mentioned that problems were available at the time, but since the government does not believe, there was any way to implement the policy of the time. He also mentioned that there was a shortage of engineering personnel at the time.

I wish to point out to this individual that the reason the Government has a short time to implement the proposed, is because a day can get an appointment. In spite of the long delays, in comparison to private industry I think an, may, interest people for their permanent jobs.

Under this individual please explain what you mean by "problems" and a short time to private contractors for flight A-3, causing broad varieties of application, as individual could have a dozen jobs. The jobs are 1957 vintage, but the costs being based on of the 1976 worth.

Nigel W. Winkler

MB mounts do big job of vibration control



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Bug 3110 hp T-34 turbo-prop engine... big, broad-blade propellers... these help make Lockheed's YC-130F and 207-2 the fastest propeller-driven transports in the world. They also presented an unusual vibration control problem... which MB Type 3110 Mounts solved to complete satisfaction.

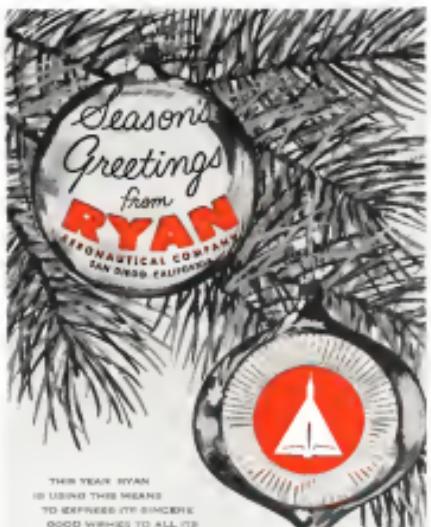
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• LETTERS

Fields of research have broadened from the more familiar areas of war studies, nuclear age, aeronautics, atmospheric physics, aerial photography, aero medical research, medical research and many other Project "Sho-horn" (as named by Capt. H. D. Sherburne, U.S.N.) of the Office of Naval Research. In fact, so wide has the new balloon research field become that it is now available to scientists in America and abroad.

I think your readers would be interested too in the available support upper status, photo balloon research for balloon teams after government and civilian laboratories. There is a massive amount of paper being cut down on the subject. One example can be Dr. F. P. Neff, Dr. John W. Webb and Dr. Leland Gold who have added a great deal to the technology of balloon design and instrumentation. Dr. J. Sherburne, at the Air Force Cambridge Research Center, unusual for the development of the magnetic lifting force, has also published papers on both these general and short air balloons. Another example is the Kauai Method Field Laboratory at Pacific Aviation Development Center headed by Col. G. P. Sharp (M.D.), Capt. Officer, Maj. David E. Stevens (N.D.) and Capt. Robert E. Johnson, director of a practical environmental capsule for extended (30-hour) flights with atmospheric shells which act the role of future space flight.

Assisting in the work of developing, testing and evaluating instruments and checks are Dr. Herman Schaefer of the Naval School of Aviation Medicine, Dr. Herman Yost of the National Institute of Health and Dr. W. H. Mueller of the Naval Personnel Institute of Physiology.

Since our earliest beginning in 1947, upper atmosphere balloon research has become increasingly more important and now is supported by all branches of the Armed Forces and by the Committee for Free Europe. The Office of Naval Research still maintains a major interest in the work, through the Naval interests in the field. Lt. Cmdr. Malcolm D. Ross is the Project Officer.

The Cambridge Research Center of the Air Research and Development Command is the center of balloon activity in the Air Force. The Signal Corps has assumed responsibility for the Army in this field.

In conclusion, upper atmospheric balloon research represents the concentrated and unique efforts of many scientists working together in the exploration of the mysteries of the earth's atmosphere and the risks are beyond a doubt in every field in which they have selected their field of study.

Broad that, it is a shining example of the U. S. Government's remarkable supporting and encouraging attitude toward science. It is a tribute to both of the public and our Government in aid to war research and in the scientists behind it who keep our nation so advanced in the field of upper atmospheric research.

RICHARD G. RAYMER
Werner Research Inc.
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Minneapolis 23, Minnesota

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A Goodyear Engineering Report, GER 4932, is available which describes the principle of operation of the GEDA electronic multiplier. To obtain your copy and a complete descriptive of the GEDA line, address your inquiry to Goodyear Aircraft Corporation, Department 933E, Akron 15, Ohio.

PS. The NEW NSA and NIB are two of more than 12 analog computing units which make up the famed GEDA line. Each unit of the series mounts in either the LS-GEDA linear computer or NJ-GEDA nonlinear computer—each unit is completely interchangeable with any other unit, can be used in any quantity, in any combination, for the widest flexibility of all electronic difference analyzers on the market today.

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G.E. Steps Up The Pace of Advanced Jet Engine Development



Teamwork with ARDC, coupled with new private investment, sets stage for significant steps forward in powerplants

At research, development, and test centers across the United States, thousands of American engineers are tackling the problem of keeping the nation first in air power. The job is of vital importance. For today we know that quantitative air superiority is not enough. Needed also is qualitative superiority.

USAFA's Air Research and Development Command directs the Air Force's all-out drive. And in one important field—aircraft powerplants—close co-operation between ARDC and engine manufacturers is now making possible new programs toward advanced engines for tomorrow's aircraft.

As a member of the National Defense team, General Electric is constantly working to cut the time needed to develop new powerplants. To step up progress on jet development, G.E. is now using the demonstrator engine concept. The demonstrator idea, by separating production

considerations from development, has allowed rapid improvements in engine components and materials, radical design advances...cut new engine development time a year or more.

But as jet engines grow more powerful, so too grow development facility requirements. The investment of private capital in new facilities makes possible development progress which otherwise could not be accomplished. Near Cincinnati, for example, G.E.'s multi-million dollar investment in component development facilities—staffed and equipped for research on all types of engines—is doing much to advance this basic art.

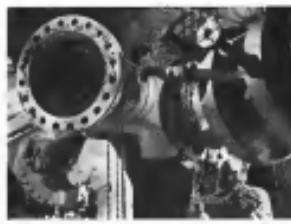
Adequate national air power calls for close co-operation between industry, the Armed Services and other government agencies. In this partnership lies the best assurance of America's future leadership in the air.

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AT G-E FLIGHT TEST CENTER, SCHENECTADY, N.Y., engine tests are conducted in special North American F-86. By far the best new prototype powerplant can be installed in both day while flight test engineers record, monitor its performance.



NEW PRIVATELY-OWNED FACILITIES such as G.E.'s jet engine development facilities near Cincinnati, help G.E. take advantage of private before phases of programmatic research.



LONG-RANGE ENGINE DESIGN STUDIES at G.E. result in new advanced powerplants. Development work is currently being carried on for powerplants of 1960's and beyond.



New ROTOCHUTE for Pinpoint Drops

Working with the Office of Naval Research, Kaman Aircraft is developing a new concept of air delivery for combat areas. The Rotochute will permit the dropping of supplies from low-flying high-speed aircraft from converted nose with propeller position. Supply planes will fly under the nose of an aircraft like at jet speeds. Following supplies will land in "friendly territory." The Rotochute is another example of the advanced research and development programs being carried out by Kaman in the National Defense effort.



KAMAN

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main assembly is scheduled by January 1957. After the initial 10 replacements, set price will be quoted to blocks of 20 or greater. Negotiations are under way with approximately a dozen companies, throughout the country. He expects to establish Skarman franchises in South and Central America and Canada by the end of this year. Recent data developed for the airplane, which is powered by a Pratt & Whitney 190 hp Lycoming engine, show a 14,000-ft service ceiling at 2,000-lb gross weight, no level rate of climb with max fuel loading gear retracted and flap down of 500 fpm, land take-off rate of 72 ft and water take-off rate of 25 sec.

PRIVATE LINES

Some 150 business planes landed at San Francisco Airport bringing deck gags to the annual Tuesday American Petroleum Institute meeting in that city. National private-aircraft traffic at the field is 15 to 20 planes daily.

Completely visual flight stations are proposed by a new organization in two major concepts that also automatically provide level or horizontal orientation, air form and degree of any climb angle. Two optional indicators indicate the amount possible error in plane's attitude, temperature indicating readings due to heat loss via friction and other possibilities. New model R-2 computer is available from Jeppesen & Co., Co-

Stephens Airfield, Denver, Colo. Price for 42 in diameter version, \$6,700, in each diameter \$9,350.

Description of a Convair 130 has been made to California State Department of Education by Larry Host, president, Air Class Co., Long Beach and Fresno, in aid of promoting aviation education.

Lowest takeoff weight increase to 24,000 lb from 22,000 lb has been approved by Civil Aerodynamics Authority. Landing weight has also been upped to 21,000 lb from 18,400. Modifications to permit higher weights include strengthening main landing gear assemblies, landing gear and spar attachment points. Low Arrestor Engineering Division, Santa Monica, Calif., is modifying earlier Lemeses to handle the higher weights.

New address of Dixie Aviation Co. is Columbia Airport, Route 2, W. Columbia, S. C. The sales and service organization formerly was located at Orange Field.

Executive DC-7 has been delivered to President Gustavo Rojas Pinilla of Colombia by Adelco North Aviation Service Co., Los Angeles, Calif. President's airplane includes a complete short-wave radio communication system. Power plants are P&W R-3350-94s of 1,150 each. Flying News Publishing Co., Dallas, Okla., has purchased an 11-place Eastern executive transport.



Cessna Delivers Tricycle 172

Aimed at making flying simpler for the businessman who flies his own plane, the new Cessna 172 is the company's newest fuselage, featuring tricycle landing gear. Powered by a 145-hp Continental, the all-new 172 sets the SR-750 1st. Wichita Cessna began delivery of the new model in mid-November. Land-Mate landing gear will extend as soon as plane's weight rests on the wheels and auto control in the air, even when rubber is applied, to keep drag to a minimum. Gravity of the landing gear is such that the plane maintains a low center of gravity for maximum maneuverability. On the ground the nose wheel is steered, with rubber 12 degrees off center and controllable with brakes on 30 deg either side. Cruise speed of the 172 is over 110 mph and range 6-45 hr. By reducing the passenger seats, over a quantity of cargo can be carried. Each of the down to 36-in. seats



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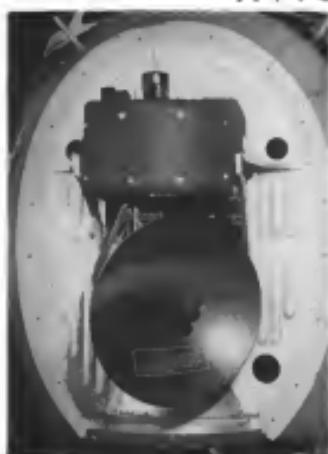
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AVIONICS



Differences between military and civil avionics equipment such as the AN/APS-47 sphere (left) and its civilian counterpart (right) stem from different procurement practices used to buy the equipment and different operational requirements.

Civil-Military Design Differences Laid to Procurement Practices

By Philip J. Klem

EVEN though there are differences exist between civil and military avionics equipment, they are more often the result of different procurement practices than of different mission requirements. Most products of civil avionics also supply the military market, so the development for one can benefit the other, even if the two are not equipped for the other.

This was brought out during a recent symposium held on the "Comparison of Design Features Required for Military and Civil Avionics Equipment," sponsored by the East Coast Chapter of the American Institute of Navigation Electronics.

The symposium's eight-hour panel represented the three military services, the airlines, lightplane operators and three manufacturers of military and civil avionics equipment.

While technological requirements do define the difference results, much

emphasis of the panel pointed up first that is no element less dividing civil and military equipment. Whereas gear for one branch of the military often shows a close linkage to civil avionics than to equipment used in another branch of the military. For example:

"Airline avionics equipment resembles, and often is identical to, that used in Military Air Transport Service aircraft while differing considerably from civil lightplanes," a source.

Atmospheric lightplanes and lightcruisers use communimic and navigation gear which closely resembles or is identical to that used by civil lightplane operators. Cost as well as weight and size are important factors in both areas because of Atma's small budget.

While technological requirements

help indicate. For example, all need strict consideration importance to equipment reliability.

While the price of avionic equipment often is an obvious consideration,

there are other factors which must be considered. For example, the cost of

airframe and powerplants, which play a significant role in total aircraft reliability. A. R. Applequist, chief engineer of Nasa pointed out:

"Size, weight and power consumption are important factors for all aircraft operation, but weight is 'critical' in many areas. Interactions can be as intense as, for example, the weight of the avionics equipment itself."

To meet the operational requirements of interwar aircraft, the Navy must make major advances into compact avionics. As a result, it is calling for avionic equipment designers to go to more subminiaturization. This positive

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"already" some serious cockpit problems, according to Al Weisch, head of Battelle-Navigational Aids Branch. Weisch also pointed out that some impact launching subjects, mannequins equivalent to a high-G shell, which may last 200 seconds.

Despite these specialized requirements, J. C. McElroy, assistant head of research and development for Collins Radio, sees little fundamental difference in design requirements between "military and civilian," avionics representative. Besides, McElroy's George Clark noted that the design of avionics equipment "is a matter of compromises."

Buying to Specifications

Some observers suspect that at least a portion of the mobility problems now encountered in military avionics represent a attributable to the fact that greater "procurement by specification" instead of "procurement by specification," instead of making most use of the competitive forces which govern commercial buying.

Considering the fact that the industry spends an average of twice the initial equipment cost every year in maintenance, and the fact that it is

difficult to get equipment which fits into specification lists, those observers believe that present procurement procedures may be "paying twice and paying foolishly."

Although there are some recent indications that military buying patterns are moving in the direction of commercial practices, the safeguards which Congress would open for military procurement make it appear doubtful that the pendulum can swing all the way.

To Lowest Qualified Bidder

When a new military device or equipment has been developed, the initial procurement normally goes to the firm which made the development. Subsequent procurements are then made on a competitive bid basis, with the lowest qualified bidder getting the job.

Although a firm's past performance on a number of contracts for a variety of atomic equipment is weighed in determining whether the company is "qualified," only the original developer has had any production experience with the specific item under procurement.

If the second procurement goes to a

new contractor, however, this company goes through the same "learning process" as the original producer. Sometimes, but not always, the same troubles which plagued the original equipment, or entirely new ones, crop up in the second procurement equipment. The lesson is that there is a lot of production know-how that can not be put on blueprints or into specification.

It takes a third procurement and a return to a new supplier, the whole cycle may be repeated. The dollars which the Government spends on initial equipment costs may be more than absorbed in increased field maintenance.

However, such is not always the case. Sometimes a new supplier makes significant improvements and refinements over the original equipment.

Airlines Buy Differently

Competition and commercial buying practices are an important factor behind the greater reliability of modern atomic equipment. William Carter of Aerostar Electronics Inc., told the Baltimore newspaper:

"For example, if Company 'X' gets



How's the Weather at 80,000 Ft.?

That's what the Signal Corps hopes to find out by launching this rapid rise balloon from Ft. Monmouth, N. J. "Tropic" balloons go to check barometric pressure at standard altitudes. Under the balloon is a gondola attached to it at a radiotelephone which transmits data to earth (radio wind baloon) receivers at left. Each longish balloon is used to catch other balloon bursts at 70,000 ft. 80,000 ft.



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as will be order for a new type aircraft system, it knows that repeat orders from that same operator, and orders from other airfields, depend largely, moreover, upon the reputation (both performance and reliability) which the equipment can supply.

If the set price estimate is dependable, Company X can be pretty certain of getting subsequent orders without fear that an "overlook" in the field might come with a slightly lower price and sing the bottom.

This does not mean that the airfields are not interested in cost. However, they recognize that maintenance costs quickly exceed the original equipment cost.

While it is difficult quantitatively to measure or define these contributions as surface operation is small and close knit enough to enable the engineering department and purchasing agent to factor such important considerations into their buying decisions.

Step in Right Direction

The recently announced policy of USAF's Air Materiel Command to possible contracts for poor performance and late delivery (AW Sept 19, p. 12) was called "a foundation stone in my mind between transportation and war which the airfields consider as buying equipment," by Collier Radke's McElroy. Collier is a source supplier of both civil and military aircraft.

"We believe," McElroy said, "that industry can and should do more in the role of supplying the military with equipment based on the same rules and procedures that prevail among business transactions. Industry should be given the opportunity and incentive encouraged to develop equipment to satisfy military requirements, using its own financial resources and to operate disseminated largely by industry."

In announcing the new AMC policy, Maj. Gen. Dale L. Tracy, Director of Procurement and Production, said: "In negotiations we will look much harder for subcontractors that contractors are willing to accept normal business risk and fully responsibility for products developed and produced."

Givs Industry Free Head

Where evidence exists that industry is willing to develop equipment on its own to meet military needs, McElroy called on the industry to "invent free-standing competitive programs." McElroy also called for "a just means of protecting industry with compensation for protection needs." If such a plan is established and adhered to, there would be no serious procurement problem, McElroy said.

The military "must find ways of informing industry's leaders and does

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The "SHS-B" shown here is composed of two single-pole, double throw switching units completely sealed in a housing filled with inert gas under pressure. Six 28 gauge MIL-W-2884 leads, six feet long, are supplied, and one from each terminal. These project at a 90-degree angle from the base of the switch. They may be run in any direction by rotating the switch.

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High power search radar, the AN/FPS-12, and all its supporting equipment can be transported in one truck and two trailers and erected in less than three hours. Set was developed by General Electric and Rome Air Development Center for use by Tactical Air Command and the Marine Corps.

of their future planning." McElroy said Security barriers should not deprive the majority of industry's nuclear and beam power. Recent moves in this direction by the Air Research & Development Command (AW, Oct. 17, p. 12), were called "a very encouraging step" by McElroy.

Engineering managers may finally accept the necessity of divergent ways to the point where little difference will exist in tomorrow's aviation equipment, he felt. Army, Navy, Air Force or an honest man," McElroy continued.

Finally to transfer its research activities to the new location.

• **Wiley Aeronautics Corp., Burlingame, Calif.** has established a new electronics division, under James H. Davis, with John T. Reilly in chief sales capacities. • **Fredick, Fredick, & Miller, Inc., Los Angeles.** is name of new company formed to develop and manufacture aircraft structural load sensors and monitors. Donald M. Freida is president; Robert N. Miller is vice president, and Jack R. Falbick is vice president. Company occupies a 12,000 sq ft plant at 13220 Prairie St.

• **Electronics Testing Laboratories, New York City.** has added a new 5,000 sq ft electronics lab to permit testing and engineering investigations into the microwave region. Company now can conduct both air-to-surface systems and components, in VHF as transmitters and receivers, and components, to provide an integrated approach, to private and government agencies. Company address: 2 East End Ave.

Other recent expansions within the aerospace industry include:

• **Lithia Industries' Power Tube Div., San Carlos, Calif.** will soon begin construction of a new 40,000 sq ft building, increasing the division's facilities to 100,000 sq ft.

• **The Rausch Manufacturing Co., Los Angeles.** has acquired 45 acres of land in the International Airport district, approximately 11 miles from the firm's present site. Company intends over-

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**new Boeing jet tanker
to stretch America's Air Arm
with mid-air refueling**

Almost daily, conference flights halfway around the World are being made because huge KC-97 tankers meet bombers for refueling in mid-air. Tankers like the Boeing KC-135 will bring "targets" on faraway Continents within striking distance. The new Boeing KC-135 will haul extra large cargoes because added strength with less weight is possible with metal honeycombs construction. Kawneer is helping build more planes like the KC-135 faster because of excellent metal bonding facilities to produce any kind of honeycomb assembly. Our experience in metal bonding honeycombs will be helpful to you in designing new applications of that material. This is another example of how you can benefit by Kawneer's integrated engineering and manufacturing service.

Kawneer will produce the structure for the KC-135 utilizing its unique sandwich construction.

Illustrated here is the Boeing KC-135 Tanker-Tanker perspective of the new KC-135.



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EQUIPMENT

Expendable Skid Brakes Lighten Vulcan Bomber Undercarriage

LONDON—Conventional wheel braking on one of Britain's Avro Vulcan V bombers has been replaced by the use of two retractable skid units with expendable tires which operate in the known surface.

This redeveloped braking system was developed in Dorset Equipment Ltd., of Chichester, which made the liquid spring gear on the Vulcan.

The skids are housed beneath the front wheel pants on each leg and when extended by fire from the side beams. When lowered, the two pads, each having fully sprung ends, narrow to a point and spread to take up to 80% of the vertical reaction for the maximum braking condition. The weight distribution between each skid and pad is automatically maintained during a braking by a sprung element operating on the dropper unit of the skid.

Between the Wheels

Twelve percent of the weight has to be left on the wheels to maintain for dynamic stability, enabling the aircraft to respond satisfactorily to one-wheel steering. Each pad is designed as a small beam, with short-life, easily replaceable, weather rubber sole. A static damping coefficient of 0.15 has been adopted.

Another advantage of the system is the attainment of one of dispensing with the skids needed to form a heat sink in the heat sinks of jet bombers. Their weight can amount to around hundred pounds. Dorset claims a 1% reduction in aircraft structural weight is achieved. Taking the weight of a logic undercarriage at about 4% of the aircraft structural weight this implies that Dorset has reduced the weight of the bomber's undercarriage itself by as much as 10%.

Other advantages of the system include the use of two sets of wheels as in fixed or braked bogies, improved braking in wet and icy surfaces due to wearing action of the specially profiled rubber soles.

Skid Design

The plan of the skid pads is fixed to the side beam within which the cylinder reappears. In this way the rod is used in the side's sliding slot, the only other connection being the long tie linkage of the lever to transfer the motion of the assault and differential braking complete into the main structure.

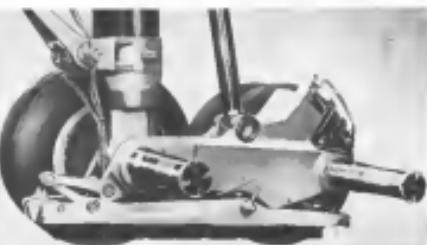
the metal tried get too hot and the slopes has friction coefficients also extended an element of inspiring night and tended to damage the rear gear. Heating of the engine however proved insignificant.

Most non-metallic materials tried had insufficient life so strength. Only a special ceramic matrix showed up with the weaves low coefficient of heat not thermal, high coefficient of friction, hard enough to avoid scoring and yet flexible enough to give to surface the same vibration control that be adopted.

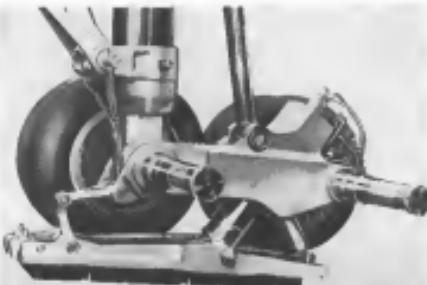
Operation is by four solenoids and electro-hydraulic valves. Full brake can be selected or the set and then applied automatically as soon as operating up is completed.

Pad Design

Most of the development centred on the choice of material for the pad. All



SKID RETRACTS—View of large landing gear legs with one wheel unit raised to show detail.



SKID EXTENDED—Large longitudinal jack bases, rubberized foot sole, runway.

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ON NEW
GRUMMAN**



NAVY
Fighters

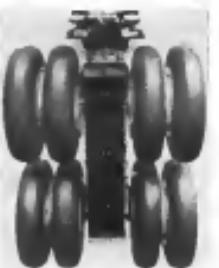
Grumman, one of the most stable aircraft companies in the industry, needs engineers to work on the new supersonic *Tiger-Cat*, *Shrike*, *Cobra*. With Grumman, your future will be Long Island, the playground of New York. If you are an experienced aircraft engineer, or a recent engineering graduate, send your resume to Engineering Personnel Dept., Interviews at Employment Office.

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SEEKING SOLE consists of three solid-polymer pads proven to set in channels for shock-absorbing material and reduce water.

pads which are chemically bonded to friction plates. These are located in the foot. In times short and secured with snap-release attachments at the toe. Friction-base granules in the pads ensure that absorbed material or surface water escape by the quickset route and do not act as lubricants across the length of the foot. Energy absorbed by the pad is

recycled back into the system. The S-59, under electrical conditions, for more than 50 minutes without any maintenance or servicing and has a capacity more than 500 starts without a failure. It is rated at 40 amp-hr and has a nominal capacity of 24 cells.



Pivots for B-52 Thrust Measurement

Amen point to joint hands built into air intakes of the J75 turbines installed on a Boeing B-52. The pivots provide engine intake air pressure for the plane's new pressure ratio indication (AW Apr. 25, p. 66) which monitors jet thrust by comparing static and engine exhaust pressures. Need for the instrument became pronounced with the development of two-seat turboprops where a small change in compressor output can result in large thrust variations over important power ranges. This role set in measurement times requiring aircraft based on static and turbine temperature. Boeing engineers used modified manometers as pressure ratio indicators on prototype B-52 flight tests. Orders for the production instrument ratios were subcontracted to Minneapolis-Honeywell Regulator Co. and Allis-Chalmers Mfg. Co.

proportional to the rubber sheared and it appears that each sole has 2 mils of several loadings.

Long-Life Battery Adopted for S-59

The Yerkes Schenck aircraft battery has been adopted as original equipment on the new Sikorsky S-59 gas-turbine-powered helicopter, according to Yerkes Electric Corp., New York.

The latter was chosen after a series of rigid competitive tests and evaluation now, the company says, in which the Sikorsky unit's light weight and long life tipped the scales.

The Yerkes battery chosen for the S-59 weighs 20 lb., compared with 30 lb. for a conventional-type lead-acid aircraft battery. According to Yerkes, the lead-acid unit would require up to 11 hours to charge, while the Yerkes unit does this in about three days, and is able to start the turbine each time times before failure.

The Sikorsky unit has been in service in the XH-19, military version of the S-59, under electrical conditions, for more than 50 minutes without any maintenance or servicing and has a capacity more than 500 starts without a failure.

It is rated at 40 amp-hr and has a nominal capacity of 24 cells.

Aero Commander • **AT-7** • **AT-10** • **AT-11** • **C-43** • **C-45** • **Brenzie** • **Twin Brenzie** • **T-34**
Air Cobra • **King Cobras** • **H-13 (Helicopter)** • **Flying Fortress** • **Super Fortress** • **C-37**
Cessna 140 • **Cessna 170** • **Cessna 180** • **Cessna 190** • **Cessna 195** • **Cessna 305**
Cessna 310 • **B-24** • **B-32** • **B-36** • **C-81** • **C-87** • **L-8** • **Catalina** • **PBSY** • **T-38A**
Convair 240 • **Convair 340** • **Helldiver** • **Sabrewing** • **P-40** • **P-42** • **P-46**
P-43 • **A-24** • **B-19** • **B-23** • **C-33** • **DC-3** • **C-45** • **DC-4**
C-47 • **OC-6** • **DC-6B** • **OC-7** • **DC-2** • **Globemaster II** • **Super DC-3**
AO Series • **Skymaster** • **Ovener** • **SeaGull** • **C-82** • **C-119** • **XC-130**
ZP-1 (Bimp) • **AFM-1** • **ZPK (Bimp)** • **ZPK (Bimp)** • **F-4F** • **TFB-6**
TFB-6 • **Lodestar** • **H-33 (Helicopter)** • **A-28** • **A-39** • **AT-18** • **B-34**
B-57 • **B-58** • **C-36** • **C-37** • **C-63** • **Constellation "049"**

what do these famous aircraft have in common?

Constellation "749" • **Super Constellation "1049"**
PV-1 • **PV-2** • **P-3V Seafire** • **XB-80-1** • **B-36**
Mars • **P-4M-1** • **PSM** • **PBM** • **Mars 200**
Martin 404 • **AJ-1** • **B-25** • **P-31** • **T-38**
C-125 • **P-61** • **Apache** • **XP-72**
Rainbow • **P-47** • **Sabres** • **Foothill**
H-55 (Helicopter) • **Norvian** • **PT-22**
Coastal (Helicopter) • **Lauster** • **Super Constellation "1049 G"** • **HUP-4**
(Helicopter) • **P-21** • **H-21**
(Helicopter) • **XT-37** • **H-19**
(Helicopter) • **T-33** • **F-84F**
+ **YC-130** • **XP-5Y**
C-130A • **XV-3 (Helicopter)** • **T-37** • **KPV**
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SPF • **83Y**
+ **RF-84F**

Such like a 100 cell of American aviation, doesn't it? From small single-engine giant bombers and populous biplane, all have one thing in common—Loos bonded-rubber engine mountings to isolate power plant vibrations. This cell indicates the past and present use of LORD engine technology. As new advances in aircraft propellers are attained—in fanjet, jet and reciprocating—LORD will continue to prove its ability to produce new mountings with greater control over propeller durability and engine vibration. They will assure less flight fatigue, greater passenger comfort and protection to aircraft structure. Look to LORD for the best in vibration control.

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the DOOR LOCK INDICATOR SWITCH



Hermetically-Sealed Limit Switch
Chosen for Dependability in Any Environment

In today's modern aircraft, remote "finger" tell when doors are properly "but closed up" for high speed flying. The Electro-Snap Door Lock Indicator Switch is a typical example. It controls landing gear door position, lights an indicator on the instrument panel when doors are securely latched, and "tells me" the door status.

To make the all-aluminum, all compression performance of the snap action series, the switch is hermetically sealed. Both electrical and mechanical parts are sealed dry, can be used for dependable operation in any environment. Temperature rating can't come close to that made in the case, the switch can't come

because all moisture is sealed out. Hermetically sealing prevents the switch from dry, oxygen atmospheres, of moisture, tempering and mis-adjustments.

Characteristics remain constant from -30°F to +250°F. The compact sprung metal actuator operates dependably even when the outside case is coated with ice.

It's little wonder that Electro-Snap Hermetically Sealed Limit Switches are first choice in all major aircraft models—for all kinds of switching jobs where dependability is a "must". For complete information on the types of switches we can supply, write to Federal and send us a description of your requirements.

*Higher temps, models also available.

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Door Switch
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Fuel Tank Transfer Switch
Electro-Snap hermetically sealed gear switch for use in aircraft fuel tanks. This unit can be used in aircraft fuel tanks.

Tower Switch
Electro-Snap hermetically sealed gear switch for use in aircraft tower. This unit is located in aircraft tower to prevent lightning strike.



Two F-100s—Snap Dependability. Hermetically sealed electro-snap switch used in the nose gear door of the USAF Air Force-Bureau Bureau.



because all moisture is sealed out. Hermetically sealing prevents the switch from dry, oxygen atmospheres, of moisture, tempering and mis-adjustments.

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Air Pump Rated for 1,000 Hr.



Model BR-10900-B breathing pump is an air pump a rated for 1,000 hr. at 100 psi and 300 ft. elevation or 60,000 ft. Altitude capacity is 375 cubic inches per minute (0.027 ft.³/min.) but can deliver at 32 ft. at 100% above rated pressure. First stage pump's displacement is 2,165 cu. in. per stroke and the second stage pump's is 0.681 cu. in. per stroke. Compressor operates at 2,700 rpm.

Each of the two-stage pump has



Single-Point Fueler-Tester

Accurately fueling aircraft can test single-point fuel manifold systems at low pressure and low rates without damage if the meter checks out satisfactorily, the unit can be evacuated over in fueling at normal rates and prevent

Ford A-Plane, built for Lockheed Aircraft Corp. and Lockheed Air Transport, has a kerosene, air, characten, drooping and expanding pressure static receptacle, fuel flow meter and static bending cable readout. Fuel system can be checked for leaks for several hours.

Hornbeam Equipment Co., 3625 E. Olympic Blvd., Los Angeles 33, Calif.

plus, 400 cpsi, 2.3 atm, continuous duty.

Lear-Rosem Division, Lear, Inc., Elkhorn, Ohio.



Power Turbine for Missiles

Avaliable power unit can be used with either solid or liquid propellants to deliver 650 with an oxygen and missile guidance and control system. The system weighs 100 lb. and can be boosted to 1,660 watts. Weight is 29 lb., dimensions are 10 x 10 x 10 in. Weight inc. 1 half-lb. in.

Propellant gaseous gas directed against a turbine wheel mounted on the same shaft as an induction gen-

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YOU CANNOT AFFORD TO OWN AN AIRPLANE AND NOT HAVE IT AVAILABLE THE YEAR AROUND.

Under snowbound conditions, aircraft equipped with Federal Skis and LDR Plastic antiskid and non-freeze bottoms will keep operating when other forms of surface transportation are stalled. Federal Sky-equipped aircraft fly to and from places where other modes of transportation do not exist.

NEW "LOW" HIGH PERFORMANCE SKI MOUNT MATERIAL

Patented "flexing" and "bounce down" action maintains skis firmly on every snow surface. Ideal for aircraft landing gear locations requiring no existing skin on the field.

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The Operations Engineering organization in the Military Relations Department at the Fairchild Aircraft Division offers opportunities for graduate engineers capable of performing aircraft utilization analysis.

These assignments will require knowledge of, and familiarity with:

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The opportunities and salaries associated with the new positions are in keeping with the responsibilities of this work. Employee benefits in the form of group insurance, individual and family coverage for hospitalization, retirement plan, sick leave, etc., are also provided.

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motor rotating at about 24,000 rpm. An output shaft turned by a pinion gear system can operate the nozzle's control mechanism or turn a pump for hydraulic power up to 45 hp.

Alfa-Flame Manufacturing Division, Garrett Corp., Los Angeles, Calif.



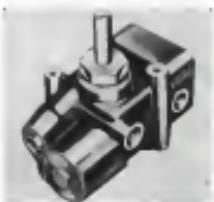
Follow-up Servo Valve

Model CD-5 servo control valve is designed for follow-up positioning systems which require position signals are obtained from cams or linkages.

The unit features actuating internal ports for linear flow at constant pressure drop, pressure lag characteristics for position accuracy, and balanced and staged sleeve and spool construction. All hydraulic connects are at the top of the valve to permit multiple installs items of cams or linkages in a minimum space.

Value flow versus displacement characteristics are suited to be easily modified to suit individual power and stability needs.

Hydraulics Controls Co., 87 Tennesse St., Newbury Rd., Mass.



Caster Control for Nosewheels

All critical elements are packaged in one housing in new forms of valves or pot, constant-gain steering valves for use on aircraft nosewheels. Valves can be mounted on the wheel strut with either motion of the strut providing follow-up as the wheel is steered. This simplifies mechanical linkage. Unit provides stable and damping action. Nosewheels can caster freely while



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the plane is not being steered, written controls desensitized control. This can be limited to short pitch or nose-up half degree. Low arresting force and inherent stability characteristics are also reported.

Videx Inc., 1490 Oldsmobile Rd., Detroit 32, Mich.



Integral Motor on Switch

Small rotary snap-acting switches have integral d.c. dc motor for surface and general instrumentation applications. Position between poles can be manually adjusted while the switches are operating.

Units are available with one to four poles containing 24, 10 or 12 shorting [12, 13 or 14] contacts, mounting contacts per pole, voltage ratings of 6, 12 or 24 vdc at switching speeds of 0.1 to 80 cps are available.

Applied Science Corp., Princeton, N.J.

ALSO ON THE MARKET

Aircraft fuel tank filler cap, Model FC-1000 weighs 4-1/2 lb. Lever action automatically reduces pressure in the tank before it is satisfied. A 15deg turn removes the cap. Unit meets MIL-C-724B (ASGI) — Cobb Special Products Division, E. Hobart & St. Croix, Wisconsin.

Michigan AH-1 is a modified glass-fiber, low-pressure laminating pre-preg that is hard and dry enough to handle in gravity of 1.5 to 2. Material can also be made soft and pliable. Tensile modulus is 10,720—Mobile Plastics Division, Carlisle Corp., P.O. Box 72, Telegraph Rd., Mobile, Ala.

Cemented oxide tool material requires no coating and shows good performance at speeds of 1,000 rpm and over, the maker says. Wear resistance is said to indicate a tool life of 23 to 1 over carbides. For finishing cuts, the material is said to reduce time markedly, taking up about one-third less off. The new material is available as a bonded bar—

Ortho Department, General Motors Co., Detroit, Mich.

Lokstrip fitting for use with Aerospace No. 666. Teflon base features high degree of resistance to temperatures from -100 F. to +500 F. Available in all sizes and pressure ranges, item is fabricated in steel stainless steel and aluminum.

—Aerogrip Corp., Jackson, Mich.

Light socket and plug-clamped locknuts in stainless steel. It can be temperature to 500F and when interrogated re-expands even at normal loads and electron temperature is designed 700 H.R.T. and 700 E.R.T. Weight weights are said to be 10.7 to 6.5 lbs less than the industry's earlier designs. —Eudra Corp., Natl. Corp. of America, 2510 Marshall Rd., Union, N.J.

Nordex MGI160-D Xeon unit for air craft cockpit inspection has 120-degree aperture and accurate placement of infrared in a cylindrical vessel permitting two infra-reds to cover the entire circumference of subject. Xeon tube head also contains the high tension gas, color and weight each 14.5 lb.—Reserve & Controls Instruments Division, North American Philips Co., Inc., 758 S. Fullerton Ave., Mt. Vernon, N.Y.

Alumite fire chamber simulates ground conditions to 700,000 ft. for environmental checking of rocket components. Model 5300 Alumite Chamber has working area of 18 in. inside diameter by 30 in. deep. A rocket may be encased in a shell in the orb to conduct heat from the subject under test.—Harden Son Division, Lethbridge, Alta. 3070 W. Grand Ave., Chicago 22, Ill.

Frank Elmer for holding wire and fabric GFS-150 woven Teflon cloth cloth on strain relief sleeve, loomings. Standard price of GFS-150 is \$0.30/meter length by 150 inches wide. Other grades are available with .40 and .75 diameter wires.—Premier Plate Elmer Co., Inc., 30 Seneca Ave., Glen Cove, N.Y.

Parasitic rubber gaskets fit drums from 1/2 in. to 14 in. and will not be fitted to drums with rectangular rounded corners and circular opening. Nominal operating pressure is 10 psig. On V-belt fits on the gasket's flat flange—Continental Rubber Works, 1943 Linton St., Erie, Pa. 16501.

Sawstop has miterhead that can be angled left or right 45° while still in motion. Designed to operate at up to 30 mph. Sawstop has been tested by Corps of Engineers, Inland Steel Co., and commercial manufacturers associated. Sawstop is a registered trademark and is available in 10, 12, 14 and 16 in. widths.



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At right: engineers and scientists work on some of the 46 major projects in progress at Lockheed



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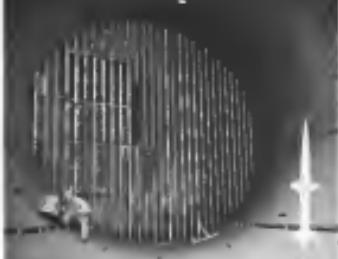
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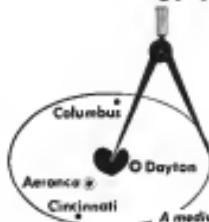
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Fort Worth, Texas



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WHO'S WHERE

(Continued from page 2)

W. E. Smith, formerly of Convair, now with the General Products and Services Division, Ford Motor Co. & Service Division, Aerostar Corp., Thornton, N. J., to handle sales and marketing of military products.

G. Ben Stubb, western sales manager, Avionics Manufacturing Co., Division of U.S. Industries, Inc., Los Angeles, Calif., coming from the Los Angeles office.

Robert Ellman, United Aircraft Co., Ltd., test pilot, has joined the pilot department of British Aircraft Ltd., a new subsidiary.

Ronald E. Pfeiffer, sales engineer, and **Walter Asmund**, Corp. Research, Calif.

W. Jean Herles, Jr., manager, General Electric Co., Syracuse, N. Y., in charge of carbide metal tube insulation, Divided Axle Sales, sales manager, carbide metal tube division.

Lowell Van Cleave, general manager, Meadow Manufacturing Co., Berthchfield, Ohio, appointed from Errett A. Scott, vice president and secretary, Elmer D. Black, sales manager, George B. Phillips, technical relations manager, William R. Stevens, production manager, and Walter M. Koff, pilot, joined management.

D. H. Gandy, Stress, former USAF chief warrant, associate dean, School of Engineering, Massachusetts Institute of Technology.

Vincent O'Connell, system design manager, solid rocket propellant program, Thiokol Corp.

John E. Smith, chief engineer-astronautics, Pratt & Whitney, Hartford, Conn.

D. Wright & Lumberton, assistant to the manager, search branch, Research & Development Division, Ordnance Systems Co., New Haven, Conn.

H. F. Prout, general sales manager, East Industral Co., Inc., Milwaukee, N. H.

Peter L. Roberts, advertising and publicity manager, Metacolor Division, Aerostar Laboratories, Inc., Los Angeles.

Alphonso J. Griffen, patent attorney, National Co. Inc., Melrose, Mass.

C. L. Brown, planning manager, Aerospace Division, McDonnell-Douglas-Wright Regulator Co., formerly deputy director of procurement and production, Air Materiel Force Europe.

Bing Gao, William S. Wren (USMC) Lt. Col., director of applied physics laboratory, Johns Hopkins University, Silver Spring, Md., previously head of air missile guidance, Office of Naval Research.

Norman J. Adler, former research engineer in Office of Naval Research, administrator for research and preliminary design, Prudential Industries Corp., Mountain, Pa.

William F. Ansible, has been transferred to Textron's Goodyear Aerial Indus Division technical center, with headquarters in Santa Ana, Calif.

Dr. M. Zarem, assigned as assistant director manager, Southern California Division, Stanford Research Institute, to open a private consulting center at 1227 W. Sixth St., Suite 100, Los Angeles, Calif.

John D. Wheeler, director of analytical planning, Prudential Industries.

Joseph W. Powers, senior chief engineer, Convair, Inc., Los Angeles, Calif.

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Continental Buys Jets for New Routes

Four Boeing 707s, 12 Viscounts, five DC-7Bs ordered as western carrier maps plans for services.

By Craig Lewis

Benson—Continental Air Lines used quickly last week to establish itself as a major competitor on its new western routes with a \$10 million purchase program for jetbuses, turboprop and piston equipment.

Continental has ordered Boeing 707, Vickers Viscount and Douglas DC-7B aircraft to serve the new Chicago-Kan City-City-Denver-Los Angeles routes awarded last month in the Denver service race (AW Nov. 21, p. 49). The new equipment program will add capacity. A fleet of small aircraft will be purchased from those of American Airlines, United Air Lines and Trans World Airlines, the three eastern Continental usual compete with for business on the route between Chicago and Los Angeles.

The \$21,300,000 sales for four Boeing 707 jetbuses imports will give the regional airline jet service between Chicago, Kansas City, Denver and Los Angeles at least three aircraft in service of any other airline, according to Robert F. Sims, president of Continental. Delivery of the 707 is scheduled to start in May 1959, and service is Aug. 1 of that year.

Delivery Schedule

The Boeing 707, which will be owned by the Pratt & Whitney 707 lessor, will enter in half current operating time between points on Continental's new route. It will carry 118 passengers and 7,000 lb of mail and cargo and will have a range of 1,000 miles.

Continental's \$18,000,000 order with Vickers is for 12 Viscount 816B turboprop transports with 35 passenger Viscounts are to be added from now through March and September 1959, and will be used on present Canadian and DC-7 routes as well as on the new transwest routes. Service is scheduled for July 1959.

The Viscount will be powered originally with the Rolls-Royce Kide 705 Dart engine rated at 7,100 hp and producing a cruising speed of 365 mph. Within a year, these engines will be replaced with the RDA 8 Dart engines with 2,300 hp, giving the airplane an ultimate cruising speed of 400 mph.

The Douglas order for five DC-7B

replaces a previous order for DC-7Bs placed in December for delivery in April 1957. They will be used in service on the new routes in April carrying 64 first class passengers or 94 coach passengers.

New Markets

Continental considers the DC-7B transcontinental and high demand to be an all-turbine operation over all but its shortest routes. The Douglas aircraft parts have been ordered to meet present needs in the period before turbine equipment is delivered. In addition, the airline ordered three Convair 440 Metroliner twin jets which will be delivered next March. Currently, Continental has six DC-7Bs, including two in lease, in Convair 840 and 21 DC-3s. Delivery of the six Convair will allow the carrier to dispose of part of its DC-3 fleet.

Continental's new routes add 1,300 miles to the carrier's present 5,000 miles system, but they nearly triple the population market. Continental will be able to top. With these new markets come inevitable problems in converting from one essentially short-range operation to another which requires long-haul aircraft routes.

Continental's present routes, recently augmented by acquisition of Pioneer

air lines, extend in all directions from Denver, Kansas City, Tulsa, Dallas, Houston, San Antonio and El Paso. The success of the airline and its 64-seat Douglas Viscount will fit a short-haul type of operation with DC-3 and Convair 840 equipment.

Indians Go West

Some of the original western flagships, namely, Pan Am 747s, Pan Am 840s and Pan Am 850s, will be joined in service by the Vickers Viscount and West Coast. The first Vickers Convair 840s and American 840s will be delivered in 1959 and will include introduction of transceivers across. A Convair interchange is operated with Braniff between Denver and St. Louis.

The regional character of Continental's system has inhibited development of branch routes, since there are few roads with enough usage and traffic density to make such service profitable. No decision on the use of the 707 in such service has been made by the airline, but the DC-7B will be operated in such as well as first class aircraft. As far as Vickers is concerned, the 707 is too large for the DC-7B can be shifted to all company operations.

Selection of the Vickers over the Lockheed Jetstar is a good indication of Continental's plan for its expansion. The Vickers transport fits in



VICKERS VISCOUNT turboprop transport model with markings of Continental Air Lines.

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RDA B for Viscount

The Viscount 110D will be using the RDA-B engine. The RDA-B engines are installed. The Rolls-Royce engines will be deleted at 1,600 after the first, according to Charles Gardner of Vickers Armstrong Ltd. Since the RDA-B's maximum is 2,000 shp, Vickers claims that 100% temperature setting should be used for the engine. In addition, the Vickers Avro 680 continental will arrive by June 1970 can selection than the Model 300 which British European Airways will operate over European routes beginning July 1970.

better as a replacement for the Cessna and a good replacement for the DC-3 than the larger Electra. So, total Airborne West's Continental contingent will require the carrier to keep a fleet of 12 DC-6 until an estimated DC-7 replacement is developed.

Service Problems

Problems involved in expanding its operations to include the new Chicago-Los Angeles route will probably keep Continental from introducing service before January 1971. One problem is the cost of equipment investment for the period before the DC-78 is delivered. The carrier will be able to add some DC-6B aircraft out of its interchange pattern to start the new service.

A bigger problem is establishment of

Continental in both Chicago and Los Angeles. Ticket and operating facilities must be built at both ports, and space is a critical problem. In addition, the airline plans to set up maintenance facilities in Los Angeles. Those needed to negotiate and establish those facilities will probably delay the start of service about six months after the January 1 date approved by the Civil Aviation Board.

Once service is started, Continental has another major problem to establish its identification in both cities. Some identification costs in Los Angeles because of interchange operations, but the airline plans a major promotional campaign to get itself before the public as a competitor on the newly awarded routes.

Promotion Plan

Passenger plane call for a major new advertising program in Los Angeles and Chicago had in with radio, television and billboard advertising and a direct mail campaign. As such, in many days the program will target off to a sound comprehensive advertising schedule.

Continental will do what advantage in the new system cities it figures will generate through traffic but most of its traffic will be concentrated in the immediate markets served. The carrier figures it can offer a better set of scheduled flights with more stops on the new route than the other two proposals and have to worry about interchange traffic. It also plans to sell an individualized, round-trip type of service which Continental feels is characteristic of a smaller carrier and which it intends

to pursue when operations are expanded.

Continental figures that business will more than double in the next five years from the new route and expansion of present services. The rate, the carrier will make, about 1,500 million. Traffic and revenue have tripled in the past five years, including a 30% increase from the merger with Panair last spring.

Traffic Gains

Figures for the first nine months of the year show revenue of \$11.7 million compared with \$8.9 million for the same period of 1969. Net revenue for the year was \$21.645, down from \$37.011 for the next month period last year.

The reduction is attributed largely to expense incurred in the acquisition of Panair Air Lines which was merged with Continental's operations April 1, 1970.

Traffic showed substantial gains in the period. Revenue passenger-miles increased from 121.9 million in 1969 to 163.6 million in 1970. Cargo traffic made a 50% gain to nearly one million ton-miles, reflecting development of the cargo market potential in an area where surface transportation is inadequate due to mountainous terrain.

Along with gains in extremes of its route network, Continental is also dealing with Denver airport authorities for space for new hangar facilities. The project will cost \$7 million and will provide maintenance and office space in a plant expansion designed as part of the general Denver airport program.

Minetti Replaces Lee on CAB; Rizley Expected to Resign Soon

Washington—G. Joseph Minetti, a New York Democrat, has been named by President Eisenhower to succeed John Lee as a member of the Civil Aeronautics Board. Minetti's appointment becomes effective when Lee's second and current term expires Dec. 31.

Minetti, 48, was a member of the Federal Maritime Board to which he was appointed by the President in August 1954. He previously had been Commissioner of the Department of Marine and Aviation and Commissioner of the Board of Commissioners of New York City. Minetti is a member of the law firm of Denton, Delaney and Minetti of New York.

Failure to re-negotiate fares for Scaife Line, an Oklahoma Democrat, was not unexpected or industry and Government critics. Lee lost his chance of remaining on the Board when Republican Ross Riles became the second member (one other Oklahoma) in February (AW July 15 p. 11). Policy of the Eisenhower Administration has not been to re-appoint Democratic members to independent agency posts.

Lee's departure, however, will allow him to seek a Federal position and lead to a complete reorganization of Board staffing. The successor will consist of Riles, Lee and Vice Chairman Joseph P. Adams against the majority votes of Chon Garber and Harvey Tamm.

Donaldson at Lee and the choice of Minetti as his replacement, however, will draw criticism. Sen. Mike Mansfield (D-Mt.) who is chairman of the Senate Commerce Committee's



G. JOSEPH MINETTI

aviation subcommittee has accused Mansfield of favoritism. Mansfield has accused Senator Louis S. Goldwater of manipulating a Commerce Department plan to seize control of aviation.

Sen. Mansfield said the appointment of John Lee was blocked "first because he was a Democrat who served under Truman, and second because Rothchild wanted his funds from Minnesota Committee dues. G. Joseph Minetti of Brooklyn appointed in that place the head of the Commerce Department much to the chagrin of both federal officials."

Although Mansfield expressed great concern over John Lee's being "too weak," he was more disturbed over the fact Garber is apparently going to use his representation on the CAB. Mansfield said: "They are not looking 'far out' to a Democrat, but they will have another Republican seat [Riles'] available and is chairman in his."

An immediate expansion of the airline's jet fleet program is now anticipated by the selected airline industry. The experimental program, which was announced on Dec. 13, 1957, with participation by 12 airlines—between Chicago, New York and Washington, and more than 300 airline offices, has speeded delivery from 12 to 24 hours and resulted in substantial savings to the First Office Department. The savings have grown from more than \$25 million for the range of revenue paid at rates averaging less than 50% of the initial compensation rates.

Braniff Orders Nine Lockheed Electras

Braniff International Airways has just announced as final aircraft order of the very rare turboprop Lockheed Electra transports with division flying to May 1970.

The airline made two trips to the far east after Braniff's order for Boeing 707 jetliners (AW Dec. 5 p. 127) indicated that the Electra will be phased out of Braniff's turboprop capacity. One of the Electras with four engines and parts will be \$27 million.

Braniff, which also ordered seven

Douglas DC-7Cs, that will, because the third U.S. airline to order the Electra (American Airlines has ordered 15, Eastern, 40) it will place the 400-seat transport on both domestic and international schedules, including the south American, Middle East South and Washington/New York routes (AW Nov. 25 p. 12).

A Braniff spokesman and the Electra will cut rates on Chicago-Minneapolis flights by 24 min., Dallas-Houston by 17 min., and Kansas City-St. Louis by 15 min.

Morristown operating altitude of the Electra will be 30,000 ft with a gross takeoff weight of 130,000 lb. It will be qualified to operate from runways of only 4,500 ft.

Seating capacity of Braniff's Electra will be 100 in the first-class configuration, 100 in the tourist configuration, and 75 in the combination coach/tourist arrangement.

P.O. Airmail Test Upheld by Court

Fed. Office Department's experiment of shifting domestic airmail service and by air has been upheld in the U.S. Court of Appeals.

The decision provides for a continuation of the experimental program and reversal of a District Court order granted by Judge W. Wallace Kaufman that prohibited the Postmaster General from shifting airmail from railroads to air.

The unanimous decision of the three-judge Appeals Court concluded that "the experimental program for carrying airmail first class mail is for carrying the statutory authority of the Postmaster General and is authorized by law."

An immediate expansion of the airline's jet fleet program is now anticipated by the selected airline industry. The experimental program, which was announced on Dec. 13, 1957, with participation by 12 airlines—between Chicago, New York and Washington, and more than 300 airline offices, has speeded delivery from 12 to 24 hours and resulted in substantial savings to the First Office Department. The savings have grown from more than \$25 million for the range of revenue paid at rates averaging less than 50% of the initial compensation rates.

Damon Predicts Gains

Ralph S. Damon, president of Trans World Airlines, predicts the airline's net income will rise in 1970 by 15% and TWA expects to fly 1,000 and a half billion passengers in 1970 which will be an increase of 13% over the projected 4 million passengers the airline carried this year.



Fairchild to Build Fokker Friendship

Fairchild Engine and Airplane Corp. announced last week it will begin construction of Fokker F27 Friendship turboprop transports for sale to the U.S. and South America under agreement with the Royal Netherlands Aircraft Fokker. Fairchild plans to begin delivery of the 40-passenger, local-area transports in 1973. West Coast Airlines has an option for ten Fokker F27s.

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performance
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INDUSTRIAL DIVISION

DAY OR NIGHT — FAIR WEATHER OR FOUL — whether the target is an airfield — refined bridge ... flying and ... immediate clamp-downs at map conferences, these ground guidance systems provide the Air Force with an efficient team capable of hitting the bullseye every time — night or day. Tested during the Korean war, the controls represented below in the model are developed and produced by Bausch & Lomb in the USAF Fine Optical Division — both at home and abroad. This completely automated guidance system is capable of detecting any type of missile or airplane, armed with or without a pilot.

Reeves has a thoroughly trained engineering group available at all times to help you solve any guidance problem. In addition to Command Guidance Systems, Reeves has a wide experience with all types of Servo systems in the development of Radar, Gun Fire Control, Servo Mechanisms, and Computing Systems of all kinds. Their extensive facilities are available

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ICAO Will Spend \$1.14 Million In 1956 Technical Aid Program

Torhmed civil aviation assistance will be furnished to 27 countries and two regional areas, Latin America and the Middle East, by the International Civil Aviation Organization during 1965-1966. C.I.A.C. 352

1956 at a cost of \$1,148,759. The program includes training of air controllers, meteorologists, marshals and other technical personnel necessary for the operation of a civil aviation organization. ICAO noted that aviation offers very sparse transport facilities for a much lower capital outlay than is necessary for the construction of roads and other surface means of transportation.

In less developed countries, methods are needed at this time to promote what the member improving institution is doing. Fellowships have been granted to study in advanced nations. The following areas will be emphasized:

- Middle East - Studies will be emphasized in this project since the training will be carried out at several well known ICAO centers. Technical personnel include experts in personnel housing and training, aircraft maintenance and certification, and a skilled pilot examiner. This will help Middle Eastern countries to develop their own training programs, to acquire first class training methods, and standards for licensing personnel for flight and aircraft inspection.

structure also will be given.
Latin America. An aviation training center established by ICAO and Mexico in 1953 is being converted into a regional center for all of Latin America. ICAO estimates that the new center will supply about one-half the requirements in this region for air traffic control personnel during the next two years. The center has already graduated more than 200 air traffic controllers, 100 radio technicians, 100 communications inspectors and 100 instructors.

Typical of the programs we developed

* Afghanistan: Continuing advice will be given in radio operations and repair, meteorology and airport management. Afghanistan has purchased considerable equipment and aid will be given in its establishment and operation. Airport construction assistance is also available.

■ **Eliköprü**: ICAO will contribute to open a school for aircraft and engine mechanics, radio operators and maintenance personnel, air traffic controllers and meteorologists. The school has already graduated 300 technicians, but the rapid development of aviation in Eliköprü creates more personnel.

partment of Airports), totaled \$2,211,7015 and registered a 29% gain over last year.

Major usage of the revenue was by
International Airport with \$1,951,349
or 44.9%.

Deduct operating expenses of the Department of Airports were \$685,991 and depreciation amounted to \$448,938. This left a net profit of \$1,085,306, or income of \$316,386 over

In addition to the 17.7% gain in passenger traffic, increases over the previous year were air freight, 15.1%; air cargo, 20.2%; air mail, 9.5%.

The report pointed out the expanded services at the Los Angeles airport were more than offset by the reduced income at the San Francisco Valley Airport, which dropped from \$144,856 last year to \$278,336 this year due to the transfer of Lockheed flight operations to Palmdale. The valley airport is being developed as a military and business-aircraft center. Total investment during the last year was \$257,336 more than income received.

Los Angeles Traffic Outstrips Expansion

Los Angeles/The increase in air traffic at International Airport here is a long as a finger past than the 1987 expansion program. The Airport Commission's annual report shows that more than three million passengers used International's facilities during fiscal 1984-85, a gain of 17.7% over the previous year, and 144% over 1987 when airline operations began at the port.

Estimates based on population growth and increased air travel indicate already inadequate international port will service 5 million passengers

Monteale, the large passenger section has passed passenger traffic. It built nine years ago and introduced temporary service facilities for a few months, according to Ralph P. Monteale, president of the Board of Airline Commissioners. Board rates on the airline's eight regular flights probably have failed to allow enough return.

Plan calls for a self-insulating board made of the same 35% gypsum fiber material and, if approved, will allow use of a portion of a previous terminal area. It leaves the use of the present area, additional runways, an airbridge and maintenance areas in their present order.

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every Phase Gains

ROUTES from Los Angeles International Airport and the San Fernando Valley Airport. (The two airports are owned by the Los Angeles City De-

Japan-Power DC-BS

Japan Air Lines has ordered four Douglas DC-8 jet transports which will be put into service on the carrier's trans-Pacific routes in early 1963. The first DC-8 is to be delivered in September 1962 to JAL and the fourth by March 1963. It is the second foreign DC-8 order KLM has ordered eight.



REEVES INSTRUMENT CORPORATION
A Subsidiary of Dynamics Corporation of America



How much machining did these Kaiser Aluminum forgings require?



The fins on this air-to-air guided missile—the Sparrow—are Kaiser Aluminum die forgings, which provide maximum strength with minimum weight.

They must be accurate enough to maintain the missile's true course.

You might guess that considerable machining of the fin surfaces would be necessary. Actually no machining was done—none was necessary.

Extremely complicated parts can be forged by Kaiser Aluminum to close tolerances, and with a finish so surface texture that costly finishing is unnecessary.

If you have a part that must be light, corrosion-resis-

tant and strong, think of Kaiser Aluminum forgings.

A Kaiser Aluminum engineer will be glad to help you at no obligation.

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Robert W. Smith, Vice President of Pan American World Airways.



James M. Gandy, Vice President of Pan American World Airways.



John W. Williams, Commander of Pan American World Airways.



John W. Williams, Commander of Pan American World Airways.



John W. Williams, Commander of Pan American World Airways.



D. C. Tracy, Vice President of Pan American World Airways.



Robert J. Ward, Manager of Pan American World Airways.



A. H. Irvin, Manager of Pan American World Airways.



E. D. Johnson, Manager of Pan American World Airways.



W. R. Smith, Vice President of Pan American World Airways.



George E. Jones, Manager of Pan American World Airways.



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W. H. Smith, Manager of Pan American World Airways.



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NATION-WIDE SALES and SERVICE

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AERO DESIGN AND ENGINEERING COMPANY

TULSA AIRPORT, OKLAHOMA CITY, DELAWARE

and certificate of public convenience and necessity for Route No. 187.

Poklon Air Lines' frequency subsidy to serve its regional service at various points extends to Route No. 187.

Delta Air Lines' temporary authority to serve its regional service at various points extends to Route No. 187.

National Airlines' fuel and rates set for domestic operations set at the rates proposed by the Board that came into effect for the period July 1, 1946 through June 30, 1947, and for the entire service period during the period Jan. 15, 1948 through Dec. 31, 1948.

Investigation and suspension of selected lines filed by Pennsylvania Air Transport, Inc., applicable between Miami, Fla., and New York, Newark and Philadelphia.

APPROVED

Central Airlines' application for authority to operate service to Woodward, Okla., on flights operated over Segment 1 of Route No. 51 on Sunday and on flights to or from it on a round trip per day from Monday through Saturday.

Introducing relationship between United Air Lines and Varney Airlines. Varney may serve as a division of United while acting as a distributor for Pan American.

Introducing relationship between United Air Lines and Thomas F. Gaudet. Gaudet now is a director of United Air Lines while serving as a director of American Midland Line, Inc.

DISMISSED

Investigation of unreasoned first class fares filed by Agent E. B. Walker on behalf of Northeast Airlines as the fares were not filed.

Shortlines

Electing-Chair Air Transport has started its London operation to the Air West, Air Transport in Birmingham Road, Birmingham, the north's largest independent airline, and the Air West, Indianapolis, as their London branch.

International Air Transport, Inc., expects airline revenue transactions for the first two months of 1947 to total \$189 million or a gain of 28% over the same period in 1946.

KLM Royal Dutch Airlines has signed an interim agreement with Aeroflot, the Russian airline, for through bookings between London and Moscow, via East Coast, Central Europe, and China, East Asia.

Condor Airlines has accepted to engage in scheduled air service between Condor and Middle Island, Alaska.

ORDERED

Piedmont Aviation, Inc., need a permit



Built-In Steps for Viscount

Built-in passenger steps will be installed on a number of Vickers Viscounts as order by Capital Airlines and offered in revised equipment on aircraft scheduled for the American market. Weight penalty of the hydraulically-operated steps is 260 lb.

Cylinder Failure Blamed in Crash

Failure of an unserviceable R2400 engine cylinder was the probable cause of the crash of an American Airlines Convair 240 near Fort Lauderdale, Fla., on Aug. 4, 1955 which killed 40 persons, according to the Civil Aeronautics Board.

In its investigation of the American accident, CAB found:

■ One 22 cylinder of the right engine was unservicably failed after less than one hour of flight time, causing a fire that the crew could not control.

■ Precautions that were recommended by Pratt & Whitney, manufacturer of the R2400, and specified on American's overhaul manual had been exercised avoided by verbal instructions approved by the engine's engineering department and were not being followed at the current inspection or handling of cylinder.

CAB said that a laboratory check of the No. 32 cylinder in the National Bureau of Standards revealed due severe fatigue cracks had passed to form a single large crack. Reviewing the history of the failed cylinder, the Board said it had been installed in October 1954 and operated for approximately 1,012 hours when eight of its hold-down studs failed. The cylinder was removed from the engine

in disassembly at the earliest. Test overheat bars and painted for test failure, according to the Board. However, it was noted, three days later the same cylinder was put back in service in the aircraft that was involved in the accident.

CAB said that company personnel testified that the practice had been in check during visits, although Avian's own overhaul manual specified and the engine manufacturers recommended that the lengths of all cylinders going through overhaul be subjected to fatigue testing of a 100% plus and above 100%.

It was further stated that the engine manufacturers recommended a series of changes in overhaul procedures and in personnel arrangements all pointed toward more strict supervision of work done by the current inspectors in handling of cylinder.

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(See 17)

GRANTED

Aeroson and American, affiliated in an air cargo joint venture of 100% each, have applied for routes on Route No. 103 at Memphis, Tennessee, St. Louis, Kansas City, Chicago, Milwaukee, and Quaker, Iowa.

Condor Airlines has accepted to engage in scheduled air service between Condor and Middle Island, Alaska.

ORDERED

Gander & Western Air Lines has been approved for landing rights at Gander, Newfoundland, on its New York-Germany route by the Canadian Air Transport Board.



For shipping convenience around the clock—

UNITED AIR LINES makes 281 flights daily— and air freight moves on every one!

Speed, dependability—because of central payload control for cargo—is one of the big reasons why so many concerns are turning enthusiastically to United Air Lines. Air Freight is an everyday tool in the profitable operation of their business.

United Air Lines' great fleet is made up of a variety of planes, ranging from giant 4-engine Cargoliners to fast DC's which provide the nation's largest high-

speed cargo lift. So no matter what you ship, or where, United can offer you air freight service tailored to meet your particular needs.

As a result, too, United brings extra convenience. Only United provides one-line air freight service to 52 cities, linking the East, the Midwest, all the Pacific Coast and Hawaii. Convenient connections speed your shipments nation-wide and world-wide.



Call the nearest United Representative
or write for free booklet, "Industry's Flying
Partner," Cargo Sales Div., Dept. J-12,
United Air Lines, 3030 S. Cicero Avenue, Chicago.



Airline Traffic—October 1955

	Revenue Passengers	Revenue Passen- ger Miles (000)	Revenue Passen- ger Miles Load Factor	U.S. Mail Ton-Miles	Excess Ton-Miles	Freight Ton-Miles	Total Excess Ton-Miles	Per-Cent Revenue Available Ton-Miles
DOMESTIC								
American Airlines	610,022	360,900	86.39	1,133,067	1,133,067	5,422,758	46,441,382	64.71
Boeing Air Transport	152,160	56,000	83.54	159,465	206,418	360,248	7,846,287	43.59
Capital	298,385	78,549	80.37	254,616	253,403	360,248	8,316,031	48.43
Continental Air Lines	346,690	9,133	50.13	132,935	30,193	76,891	903,793	42.91
Convair Air Lines	95,784	87,309	54.54	63,649	87,981	110,839	2,816,031	46.43
Delta Air Lines	184,133	78,947	81.89	806,559	293,252	548,977	8,291,595	58.09
Eastern Air Lines	134,810	278,000	80.00	158,250	158,250	59,749	59,749	50.00
Express Air Lines	8,611	33,053	58.98	8,625,021	21,750	31,934	48,750	55.71
Hawaiian	47,736	1,531	63.38	14,581	81,581	31,934	985,313	61.70
Horizon	114,053	71,398	80.08	313,850	899,726	678,035	8,648,053	53.88
Twa World	380,176	860,387	86.70	1,097,364	984,276	2,023,984	11,978,813	61.64
United Air Lines— Western Air Lines	823,407	347,913	89.11	1,091,400	1,119,387	3,128,909	26,903,271	61.69
Wesair	720,218	45,381	80.01	80,459	10,969	10,969	4,914,219	54.39
INTERNATIONAL								
Aeroflot	10,589	7,370	45.31	11,486	3,411	975,364	1,073,307	45.43
Boeing	5,673	5,928	83.89	28,849	86,879	789,000	36,529	52.59
Cathay Pacific Airways	8,807	722	50.57	961	9,375	47,809	4,235	42.55
China Airlines	1,471	1,471	49.00	1,471	1,471	49,000	49,000	33.33
Delta Air Lines	3,368	8,484	86.85	7,741	8,484	48,419	34.88	48.41
Egypt	14,844	10,940	53.56	67,888	66,094	9,967,404	10,641,287	49.89
Mexican	1,308	4,480	48.81	8,379	4,450	44,665	577,065	49.89
Northwest	7,554	15,145	79,615	79,615	17,856	643,178	3,089,787	39.32
Pan American World Airways	8,801	7,798	48.47	38,897	290,640	1,136,719	2,567,197	33.67
Africa	8,801	8,801	80.40	903,066	2,016,413	9,375	9,375	59.45
America	59,659	92,504	66.58	1,095,269	1,311,830	6,954,034	47,497	47.49
Pacific	19,389	76,118	59.76	306,878	1,346,463	11,954,087	99.99	99.99
Latin America	11,281	18,918	83.75	45,019	856,789	1,675,154	31.83	31.83
Pan American-Gates Airways	59,074	51,411	88.46	667,593	668,514	7,170,389	48.34	48.34
Twa World	7,415	16,497	71.56	87,056	84,269	9,084,069	66.66	66.66
United Air Lines								
LOCAL SERVICE								
All American	33,944	5,503	46.47	6,599	98,459	553,754	47,356	47.356
Bonanza	18,607	8,340	47.59	3,918	8,451	4,654	919,118	49.19
Central	4,511	1,571	57.71	1,571	2,079	5,381	5,381	45.00
Frontier	3,470	1,136	74.88	1,136	8,293	409,912	53.89	53.89
Lake Central	13,663	1,368	46.05	4,051	16,518	177,055	34,655	34.65
Midwest Airlines	32,099	5,500	52.68	4,388	8,395	8,392	545,675	55.98
North Central Airlines	48,226	6,406	95.76	15,063	34,803	466,520	476,520	45.00
Southwest	55,553	3,011	37.13	2,004	18,874	386,230	386,230	33.64
Trans World	24,496	5,246	54.74	12,171	12,171	75,195	653,310	48.88
Alaska	11,083	8,590	40.35	5,445	16,500	4,451	878,543	42.88
Seattle Airlines	84,595	5,211	54.83	5,445	8,559	8,559	8,559	—
Southwest Airlines	15,444	3,599	49.99	18,350	6,918	14,136	388,366	39.36
Twa Texas Airlines	17,795	3,194	41.16	4,777	8,349	8,325	369,545	49.93
West Coast Airlines								
OVERSEAS CARRIERS								
Aviation	38,093	4,465	55.33	3,569	186,472	936,496	21,371	21.371
Twa Pacific Airlines	14,625	1,796	47.87	936	9,043	168,211	46,68	46.68
CARGO LINES								
American West Airlines	8,795	90,880	76.65	14,299	642,758	542,258	80.38	80.38
Hawaiian Air Lines	7,102	8,871	74.29	38,085	6,541,208	8,706,011	76.86	76.86
Skyway					6,365,141	5,572,319	75.34	75.34
United Airlines					1,371,309	1,373,308	94.09	94.09
HELICOPTER								
New York Airways	3,338	47	61.84	811	1,414	405	7,070	56.45
Los Angeles Airways	576	22	38.56	3,312	5,230	5,230	5,230	36.47
Heliexpress Air Services (Chicago)					3,215	6,215	40,78	40.78

* Not available.

A TRUE STORY OF AIRWORK



THE PRESIDENT DROVE THE TRUCK

The phone call came through long after the plant closed, and all bet the executive still had gone home. That was over six hours ago. Now, it was midnight on a dark and lonely mountain road.

One more curve in the endless series of switch turns. Then the headlight picked up the small strip—...the crippled plane....the anxious looking men waiting in front of the hangar.

Airwork was delivering an overhauled engine to a customer in trouble. The president drove the truck over 200 miles that night. Like every man in the company, he was taking his place in Airwork's tradition of Personal Service to the customer.

DISTRIBUTORS FOR AC SPARK PLUG

PEATT & WHITNEY AIRCRAFT

CONTINENTAL MOTORS CORP.

ARLINGTON

* ATLANTA

Airwork
CORPORATION
Millville, New Jersey

MIAMI * NEWARK



Rainy Night Over New York

(Part II)

[This is the second in a series of columns on air traffic control. In the first column (AW Dec. 13, p. 142) the writer was on a Boeing 747 flight with weather and heavy Sunday night traffic into LaGuardia.]

To get a feeling for the amount of traffic involved in approaches to this single airport it should be noted that many New York holding patterns were scripted up to 12,600 ft. This requires 20 to 30 aircraft awaiting their turn and requiring space communications to control their progress.

Now we figure, for a moment, to consider the average residential telephone. It is generally a private line. In the suburbs a two-party line is occasionally found, and in rural areas a dozen phones may be on one circuit. But even that is nothing heavy compared with the 20 or 30 party-line systems with which we traffic now operates.

Drop-off service frequencies for various sectors and control locations around metropolitan airports, the overload on most channels is immense. It is no longer a question of cutting down the workload—we are now concerned with the number of syllables per minute.

Airspace Waste

Each aircraft must report leaving altitude, or flux, upon receipt of a clearance. If 10 seconds are to be allowed down in a holding stack the controller will, theoretically, issue 10 clearances (one at a time, of course) and receive 10 replies. The cycle should consume about 100 seconds. But that is theoretical. Actually, the process takes three or four minutes at best. Thus, by the time Number 10 transmission is completed, the next clearance for Number One is overdue by several minutes. He has not been able to descend to the next lower altitude. This wastes altitude.

There were several reasons for transmission delays on the night of Oct. 30. Identical trip numbers on different altitude flights caused an confusion and "wrong numbers," in eternal problem. New arrivals in the thick lightning-interception formations to associate their arrival with the route they were monitoring—the frequency they were assigned to file, but the fact of such an approach could land itself in someone's conversation. As a practical matter one pilot who waits long enough to make sure the air is clear before pressing his "make" button will simply never get a word in response. Another source of interference comes from controllers in adjacent cities using the same frequency.

Additional Voice Frequencies Not Enough

There also were delays because the controllers could not contact an enroute. Many flights were getting close to the end of their holding and found it necessary to call their enroute stations for information regarding weather and traffic at their ultimate as well as enroute altitudes.

Previously no enroute aircraft could VHF transmitters. Therefore some flights were "off the net" a clearance time and the entire traffic system was delayed and returned to the control frequency. It is true that DDF equipment is now in existence but, as a practical matter, it is impractical to use it on a VHF.

It is evident that part-time traffic controllers can no longer cope with the air traffic situation. If more traffic is to be flown such things as automatic transmission and signal priority, recentering and mobile "radio telephone" processes must be used. Many of these methods are used elsewhere; they must now be brought into the aviation picture. Additional voice frequencies and more "live bodies" will be highly suffice.

DEAN & BESON

AXIAL FLOW FANS

- RESEARCH
- DEVELOPMENT
- TESTING
- PRODUCTION



Engine vibrations are not permitted to the blades because the blades are mounted on the motor. (See photo 2111-400.)

SPECIFICATIONS

MATERIALS: Aluminum—Magnesium—
Invar—Brazed-Bonded—Ceramic—Boron
Metal.

SHOCK Absorber: solid, fiber, cell and
porous materials.

PERFORMANCE: wind pressure up to 10
inches of water. RPM up to 6000 rpm.
Diameter: 100 mm. Current: 1000 mA.
The motor is a permanent magnet.
Current: 1000 mA.

TESTING: 100 hours required to meet high
temperature tests. No breakdown
should occur in 100 hours. All electrical
parts must be checked for insulation
and short circuit resistance. The
motor should be checked for insulation
and short circuit resistance.

DISASSEMBLY: the case and motor
should be disassembled without
damaging the motor. The motor
should be cleaned and dried before
being reassembled. The motor
should be checked for insulation
and short circuit resistance.

PACKAGING: the unit should be
packaged in a protective case
including the motor. The motor
should be checked for insulation
and short circuit resistance. The
motor should be cleaned and dried
before being reassembled. The motor
should be checked for insulation
and short circuit resistance.

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If your town is like most in the U.S., here's what the figures show: 1 out of every 10 homes are rock-bottom shams. Nearly one-half anguish need basic repair.

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Skills are YOUR framework

Your taxes go up because it takes more money for your town to fight the diseases and delinquency and poverty spawned in the slums. The security of your family goes down because the slum is the natural breeding place of crime.

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Every firm has a responsibility toward the town where it's located. Part of it is to support community improvements as any other good citizen would.

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Cross and individual groups must have business back-up—your firm's backlog if they are so inclined.

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A group of Americans from every walk of life has joined together in a non-profit organization to combat home and community discrimination. A.C.T.I.O.N., the American Council To Improve Our Neighborhoods

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AVIATION WEEK—DECEMBER 14, 1959

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One Step Toward Better Air Traffic Control

The major issue at stake in replacement of Frederick E. Lee as head of the Civil Aeronautics Administration by his deputy administrator, Charles J. Lowen, Jr., is the future of air traffic control.

For more than six months CAA has been the focal point of a rapidly growing crisis in air traffic control. During this period CAA has been the target for a rising volume of bitter criticism on this score by airline pilots, airline management and the military. It is the airlines, composition, Air Force and Navy that do the vast bulk of Federal airways flying in instrument weather when the air traffic net gets tightened and most dangerous.

Airways were warned last August:

"A much more vigorous approach to the air traffic control problem is necessary now if aviation is to avoid the tragic consequences of more mid-air collisions, economic strangulation of airline revenue and blighted efficiency of Strategic Air Command and Air Defense Command operations."

Gen. Curtis LeMay, commander of Strategic Air Command, rapidly threatened to push for military control of the airways system unless it was modernized to meet current and future military needs. Lt. Gen. Joseph Starnes, commander of the Military Air Transport Service, publicly attacked the Federal airways and traffic control system as inadequate. Com. Smith's public blast was delivered before the Washington meeting of the Radio Technical Commission for Aeronautics, whose members are experts on the airways problem. Committees of airline pilots and operations executives working within the present traffic control framework are for the most part irreconcilable. Air traffic control problems have been the theme of many that are now meeting of top level airline management, and the Air Transport Association has been deeply concerned.

Pressured Into Action

Last summer, CAA under Lee's leadership fought a bitter rearguard action against integrating Air Defense radar into a common traffic control system. Only heavy pressure from other agencies forced CAA into the Deer Island (Boston) experiment that will eventually lead to an all radar system between Boston and Norfolk. CAA's most recent long-range improvement plan has been rejected by the Air Coordinating Committee's New panel as "too little, too late."

Uncrossing the CAA situation, Under Secretary of Commerce Louis Rothschild brought in Lowen, first as a special consultant last May and then as deputy CAA administrator in August.

Lowen, like Lee, is a pilot and a Republican. He served with the Air Transport Command in World War II, then went with Capital Airlines after the war and later managed the municipal airport at Denver. One of Lowen's first conclusions at CAA was that air traffic control was its most critical problem and a fresh and more vigorous approach to solving this problem was us-

ingly required. He drafted a plan of action including establishment of an air traffic control operation separate from the traditional CAA Office of Federal Airways. Lowen also wanted to recruit fresh traffic control talent to operate the new group. Lee vigorously opposed Lowen's air traffic control proposals.

New Approach

On Oct. 10, just after Com. Smith's outburst, Aviation Week again warned:

"If CAA does not take necessary action immediately (on air traffic control) Congress will have to designate some other agency to solve the problem."

Under Secretary Rothschild did not wait for the passivity of congressional pressure. Shamed by reaction from airline management and the military, he took what he considered the necessary action at CAA. With President's approval he fired Lee and replaced him with Lowen. This action was a clear endorsement of a new and more vigorous approach by CAA to the air traffic control problem.

Lowen and top level Commerce Department officials are firmly committed to a program of improved traffic control. It will indeed be surprising if an independent traffic control group is not established soon in CAA, headed by top notch experts in the field. It is likely that Lowen in picking a deputy will get a man who has practical experience in air traffic control problems both in a pilot and in the bureaucratic maze of Washington.

Lowen's Problems

Lowen will find, like other CAA administrators who have preceded him, that his biggest roadblocks in making progress are likely to come within his own organization where an entrenched bureaucracy has been hampering obvious to the most technical changes that have spurred aviation. There are a great many capable people in CAA. One of Lowen's toughest tasks will be to find them and weld them into a solid, technically competent team that is firmly dedicated to solving, not shooing off, aviation's critical problems.

Lowen also will find widespread external support for a vigorous and technically sound attack on the problems of air traffic control.

The metal is being cut at Seattle, Santa Monica and Burbank on a great fleet of jet transports. The airlines are placing billions of dollars in orders for these planes in the expectation that they will be able to carry the American public in these vehicles and swiftly by 1960.

Under the Civil Aeronautics Administration takes the lead now in building a Federal airways and air traffic control system that can handle these jet transports. American aviation will drift steadily toward the world class in 10 years.

—Robert Holt



"CITY OF MERCED" CREW WINS SAC COMPETITION

B-47 Team Pinpoints Sacramento "Target"

THE STORY BEHIND THE STORY

It made September headlines when a crew of shear rats in a Boeing B-47 bomber and their precision electronic equipment "The Secret" in this case was the annual competition to test the effectiveness of bombing and navigation skills of Strategic Air Command. The team from March Air Force base each flew 9000 miles on a long mission demonstrating the extreme accuracy of our strategic bombers.

Piling up more points than any other team in the contest, the men of the "City

of Merced" earned the title of "the world's deadliest bomber crew." On one of their runs the target was the northeast corner of an industrial plant in Merced. Flying nearly straight and above the clouds at a speed of nearly 500 miles an hour, the "City of Merced" dropped its "bombs" within a sheet's throw of the designated target.

Working all the way for the Navigator-Bombardier-Observer was the K Navigation System. This system developed for the Air Force by Sperry, fine-sighted the target by radar. With the Observer keeping the instruments clearly over the target on the radar scope, the K

System automatically navigated, flew the plane compensated for the effects of speed altitude and wind on the "bombs" so they dropped and then returned to the "bombs" of the exact instant required to score the desired hit.

It's a signal confirmation of dramatic proof of what the Air Force is doing to discourage possible aggressors by making certain an aggressor nation will be hit hard and swiftly should it take belligerent action. And the K Navigation System is another example of Sperry's ability to produce equipment which helps ensure the success of military missions.

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